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# BRITISH AFFAIRS

A QUARTERLY REVIEW

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*Special Articles*

THE LAW by Lord Shawcross

NUCLEAR POWER by Sir John Cockcroft

THE JET AGE by Sir Frank Whittle

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VOL. III, NO. 1—MARCH 1959

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BRITISH INFORMATION SERVICES  
(AN AGENCY OF THE BRITISH GOVERNMENT)

# BRITISH AFFAIRS

VOL. III, NO. 1—MARCH 1959

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## — About British Affairs

“British Affairs” seeks to offer its readers a range of articles and notes about Britain which are of more than ephemeral interest. Its purpose is to give the facts about the big issues which confront the British public and have aroused public interest also in the United States.

In this issue Lord Shawcross, one of Britain’s greatest lawyers sets out the fundamentals of English Law, and Sir John Cockcroft, a leading nuclear physicist, describes the elements of the nuclear energy program. We hope in future issues to give further exclusive signed articles dealing with other aspects of British life and achievements.

In recent issues we have tried to assemble the main points of the British educational system and in this issue the particular question of examinations is described, since B.I.S. have received many enquiries about it.

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### “BRITISH RECORD”

*Shorter notes on current British economic, political and social developments are issued twice monthly in the four page newsletter “British Record.” This will be mailed regularly, free of charge, on request.*

# The Law

by

Lord Shawcross

It may be that the English are, by some native and traditional, although sub-conscious, discipline, a peculiarly law abiding people. Certainly they have a strong sense of law and order. But, paradoxical as it may seem, they have no respect for abstract legal principles as distinct from rules which have been applied in concrete cases, and little interest in the theories of jurisprudence. For the most part, their law, like the constitution of their country, is unwritten, the result of a thousand years of growth and called the Common Law of England because it was based upon what was the universally accepted custom of the Realm, broadened down from precedent to precedent, by the decisions of Judges in particular cases. There has been no attempt at general codification of the law although, in recent years, the law relating to particular subjects has been consolidated and codified in single Statutes.

Yet despite this major element of Judge-made law, the number of legally qualified Judges in England and Wales is scarcely more than 100. There are only 20,000 practising lawyers in the whole country. Add to this that the Police Force is neither armed nor numerous and it is fair to conclude that the English do have a certain instinct for the law. And in spite of its lack of any theoretical foundation, in spite of its lack of form and system, English law has succeeded in dividing with Roman Law the empire of almost the whole civilized world. Only two considerable masses of population stand outside the influence of one or the other: The Mussulman East, which obeys the sacred law of Islam, and China, which has a body of customary law of great antiquity but of her own.

## WHO'LL BE THE JUDGE?

The course of English law has been profoundly affected by the development at an exceptionally early stage of her political evolution of a strong central administration in the hands of a succession of able and masterful Kings. One of the chief characteristics of judicial administration from a very early date was the itinerant Judges progressing from the Central Courts in London throughout the Counties of England, administering what was called "the King's Peace"—crimes being alleged to be "against the Peace of our Lord the King" and making the hand of the



central authority felt in the most remote parts of the Kingdom. Today, as from Plantaganet times and before, the whole English legal system is pivoted on the Judges in London, a score or so of men who try cases in the High Court and at periodical intervals travel round the country administering justice at Assize Towns in a system which is substantially the same now as when it was fixed in the reign of Henry II. Under them, distributed throughout the country are about 60 County Court Judges who deal with civil claims of limited amount with appeal to the High Court, and the Stipendiary Magistrates and lay (and unpaid) Justices of the Peace, the last of whom try by far the largest number of criminal cases.

It was largely this centralization of the Judges in London which led to English law being forensic and strictly professional in origin whereas Roman law and many systems deriving from it are scholastic. The Judges always have been and still are selected from the ranks of practising barristers. They are not, as in some continental systems, a profession apart from the profession of practising lawyers, and their career and training has been in no way influenced by the State except when they come to be selected and appointed as Judges. As to this, there is no system of election, nor is there any question of the State examining and selecting a candidate. The men who have come to the top of their profession, who are highly thought of by their colleagues and by existing Judges are appointed, regardless of political considerations on the advice of the Lord Chancellor, himself the head of the Judiciary. And once appointed, they are entirely free of State control, for a Judge cannot be dismissed except on an express resolution of both Houses of Parliament, a thing which has not happened in a 100 years.

#### THE LAW IS REASONABLE

The fact that until comparatively recent years the process of keeping the law in touch with the changing needs of society was essentially a practical one, accomplished by the Judges in each particular case, led the poet Tennyson to refer to

“ . . . the lawless science of the law,  
That codeless myriad of precedent  
That wilderness of single instances.”

But it was also this which has given the English Common Law the incalculable advantage that the Judges, whilst indeed professing no law making powers, could by a process of “interpretation” adapt it to the needs of new circumstances perpetually recurring. Thus, the vast ma-

majority of civil actions nowadays are based on the allegation that injury has been caused by some negligent conduct. Yet the whole conception of the law of negligence is the Common Law response to the realization of social responsibilities unthought of in the eighteenth century. The vehicle by which this development has been effected is "the reasonable man." The Common Law is said to be founded on reason and it therefore enforces a standard of conduct such as the reasonably prudent and careful man might, according to the opinion of the Court, be expected to exhibit in the circumstances. The reasonable man is, therefore, a reflection of contemporary habits and conduct, constantly changing as society progresses.

All this is not to say that in more recent years deliberate legislation has not become an important source of law in England. In a modern State where the functions of Government and of social and economic life constantly become more complex, an increasing activity in deliberate legislation is inevitable and desirable. Yet in spite of the rapidly growing mass of legislative enactments, the Common Law and the Judges, whose task it is to interpret and apply Parliamentary statutes, continue to exercise a dominating influence on the administration of the law.

#### EQUALITY BEFORE THE LAW

The supremacy of the Judges in the administration of the law has resulted in another notable characteristic of the English system, the equality of all before the law. The Crown and Government, the Executive and its officials, are subject to exactly the same laws administered in exactly the same Courts as the most humble citizen. Although in the recent development of the so called Welfare State and planned economy, there has been a tendency to allot the decision of certain matters arising in the course of Government administration to special Tribunals, there is no established system of administrative law or administrative Tribunals. The Government and its officials derive such power as they possess from the ordinary law. If a citizen complains that those powers have been abused or exceeded, the complaint is dealt with by the ordinary Courts. Only the Sovereign herself is personally immune from suit. But the orders of no man, not even of the Sovereign provide any excuse in law for the doing of an illegal act.

#### THE ELEMENTS OF FREEDOM

The English Constitution being itself unwritten—the French commentator de Tocqueville said that it did not exist—it follows that there are no guarantees of the personal freedom—the liberty of the subject,

freedom of speech, the right of free movement within and without the realm. Yet these things are axiomatic and a person who is arrested has a right at once to be brought before a public court and to be tried for his alleged offense. No one can be forbidden in advance from saying what he likes, unless a Court in public trial has decided that what he says constitutes a wrong, e.g. a libel—actionable at the suit of some third party injuriously affected or has involved a breach of the criminal laws, which are themselves traditionally favorable to the free expression of opinion.

English procedure, especially in the criminal courts, is accusatorial rather than inquisitorial. The complainant must prove his case. Before trial and at trial, an accused person is stringently protected against any kind of inquisitorial procedure. It is not for the Judge to probe into the matter. He acts with complete impartiality as an umpire between the contestants and decides according to the evidence as presented to him. And the evidence itself is strictly limited. Only the sworn testimony of witnesses, subject to cross examination can be heard. There must be no hearsay, no evidence of previous offenses or bad character. The trial must take place in the full limelight of press publicity.

#### ONE LAW FOR THE RICH . . . ?

Nor are these rights of the subject under the law, the right to equality and personal freedom, illusory ones. It was Anatole France who wrote that "the law in its majestic equality forbids the rich as well as the poor to sleep under bridges, to beg in the streets or to steal bread." And at one time there was truth in this criticism. But shortly after World War II, a scheme of Legal Aid and Advice, subsidised by the State but administered with complete independence by the legal profession itself, was introduced. This enables those who are unable to meet the costs of litigation themselves, to obtain legal aid or advice either entirely free or subject to a contribution scaled according to their means. The old reproach that the Courts, like the Ritz Hotel, are open to rich and poor alike, no longer has any validity in England.

#### JP'S AND JURIES

Reference has been made to the small number of legally qualified Judges. This is due to the large part played by laymen in the administration of justice. The great mass of criminal cases, being ones concerning comparatively minor offences, are tried by unpaid lay Magistrates called Justices of the Peace. And this participation of laymen is important in another connection. All serious criminal cases have to be tried by a



Judge and Jury of twelve ordinary citizens. And, in several classes of civil litigation, such as fraud or defamation of character, a party can, if he desires it, insist upon a Jury. Where cases are tried with a Jury, it is they, and not the Judge, who are the sole judges of fact. The Judge decides questions of law; he sums up the facts to the jury. But the ultimate decision on the evidence rests with them. There have been criticisms of this large use of the lay element in complicated cases. Juries may be stupid, bigoted, influenced by extraneous considerations. But so may Judges. It is better to risk a bad jury making a mistake in a single case than to have a bad Judge able, if not checked by a jury, to make mistakes throughout his judicial career. The jury is the representative of the "reasonable man" who has done so much to temper the administration of the law to the changing circumstances of the time.

And so the law of England continues to develop.

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### *Who's Who*

British Affairs is to offer a series of specially commissioned articles by men and women who are acknowledged authorities in their own fields. This issue contains articles by three such authors:

*Baron Shawcross of Friston*, better known by his former title, Sir Hartley Shawcross, is one of Britain's most eminent lawyers. In the Labour Government he was Attorney-General (and prosecutor at the Nuremberg trials), Delegate to the UN General Assembly (1945-49), and President of the Board of Trade (1951). In April 1958, he resigned his Parliamentary seat and became a director of the Shell Petroleum Company. In January of this year, he was created Baron, a life peer, and so becomes a member of the House of Lords.

*Sir John Cockcroft*. One of Britain's leading nuclear physicists, but an electrical engineer too, who contributed much to the development of radar. In 1951, he shared with Dr. E. T. S. Walton of Dublin the Nobel Prize for Physics and in 1958 was awarded the Niels Bohr Medal for his contribution to the peaceful uses of atomic energy. He is now in charge of Scientific Research in the UK Atomic Energy Authority, but will shortly leave to become head of the new Churchill College of Science at Cambridge University.

*Air Commodore Sir Frank Whittle's* place in aviation history is assured for all time as the inventor of the jet engine. At the age of 21, as a cadet in the RAF, he wrote an examination thesis on the possibilities of the gas turbine for jet propelled flight. The first successful flight of his jet powered aircraft took place in 1941 at 200 miles an hour faster than the fastest RAF fighter of its time. In 1948, he retired from the RAF and until 1952 was technical adviser to BOAC. He is now associated with the Royal Dutch group of companies.



*Are exams in the British educational system reasonable tests of proficiency and excellence or monstrous impositions on the child or student? This article describes the examinations.*

## Examinations!

A notable feature of British education is the delegation of authority and an avoidance of directives. This has led to much diversity of practice among schools, even schools in the same area. Nevertheless there are broad similarities. An important influence in bringing this about has been the public examination system. The external examinations held annually in the secondary schools and more recently the "11 plus" examinations taken by children due to transfer from the primary to secondary level have necessarily exerted a very powerful influence on the content and organization of education. They have also done much to maintain and raise standards.

### I. "11 PLUS" EXAMINATIONS

One of the few statutory requirements placed upon local education authorities when planning secondary education is that it should offer "such variety of instruction and training as may be demanded in view of" their pupils "different ages, abilities and aptitudes." This leaves local authorities free to plan secondary education in whatever form is best suited to local circumstances, but in practice most local authorities in England, Wales and Northern Ireland provide secondary education of three types, grammar (a largely academic curriculum), technical and modern (general and practical courses). In Scotland there are two types of secondary education, Junior for students leaving at 15 and Senior for students leaving at 17 or 18.

But potential abilities and aptitudes have to be determined if they are to be developed and catered for. And it is here, at the time of transfer from the primary to secondary school that the first major educational test in the form of the "11 plus" examination must be met.

To determine the type of secondary education for which they are best suited children are tested in the spring of the school year in which they attain the age of 11. These tests are organized by the local education authorities. There is no standard practice, but the various procedures have enough features in common to make possible a description of the



methods generally adopted. The form of the examination is usually such as to measure general aptitude and attainment in Arithmetic and in English. A sample of questions typical of a selection examination is given elsewhere in this article. It should be noted that the questions are based not upon the full curriculum, since abler children will certainly have covered more ground than the questions reflect, while slow learners will not have covered as much.

The tests are administered by children's own teachers who also mark them and convert the raw scores into standardized scores so as to allow for differences in ages. The marked lists and scores are sent to the Education Office of the local authority to be checked. The order of merit list based on cumulative scores is then prepared.

The available places in grammar and in secondary technical schools determine the number of children who will be transferred to these selective schools; the remainder—on average approximately 75 per cent of the total—will go to secondary modern schools. It is accordingly possible to draw a theoretical line on the order of merit list so that the number of children above it corresponds to the selective places available. In practice it is usual to draw two lines, one above the theoretical line and another at a corresponding point below. Children whose names fall above the upper line are allocated to selective schools without further consideration. Children whose names fall between the two lines, half of whom will go to selective schools, are said to be "on the borderline." In respect of these children the examiners take into consideration additional evidence on their relative suitability for selective education. This evidence may comprise reports previously submitted by principals of primary schools, the children's school exercise books, or whatever may be gleaned from an interview; sometimes borderline children are given additional tests.

Selection at "11 plus" has been the subject of substantial criticism in the last few years. Its critics say that the tests have a harmful backwash on the work in primary schools; that young children should not be subjected to the ordeal of public examination, and that no selective process, however refined, can prognosticate subsequent successes with certainty. Public uneasiness however seems to stem mainly from the belief that a child who does not go on to a grammar school is somehow branded as inferior. In fact, of course, the vast majority go to the secondary modern school. Some education authorities are dropping the term "secondary modern" and calling these schools simply secondary or high school. But it is widely accepted that children do differ considerably in abilities and aptitudes and that these differences can be catered for, for the most part

## *GCE Examination—Ordinary Level*

- I. **Pure Mathematics:** four papers, of which candidates must offer three.  
*Arithmetic and trigonometry* 2 hours, choice of 9 questions out of 11.  
*For example:* Rainfall on a flat rectangular roof 20 ft. by 11 ft. flows into a cylindrical tub of diameter 5 ft. Find, in inches, the increase in depth of the water in the tub caused by a rainfall of 0.12 inches (Take  $\pi = 22/7$ ).
- II. **English Literature:** one paper of 2½ hours, testing knowledge of prescribed text-books. Five questions must be answered from a wide choice covering a variety of texts. *For example:*
- (1) On *As You Like It*. 'Rosalind's character is made up of gaiety and natural tenderness.' What evidence is there in the play that Rosalind possesses these two qualities?
- (2) On *Keats: Selections*. Show how interest in the story of The Eve of St. Agnes is enhanced by the poet's vivid presentation of detail. Support your answer by quotation or close reference, but do *not* tell the story of the poem.
- III. **Physics:** one paper of 3 hours, with 7 questions out of a choice of 16.  
*For example:*
- (1) Describe, with the aid of a diagram, the common hydrometer and explain its use. What would be the effect of (a) increasing the cross section of the stem, and (b) increasing the weight?
- (2) Define *coefficient of linear expansion of a solid*, and describe an experiment to determine its value for a metal rod.  
 Describe briefly two instances in which the expansion of a solid with rise of temperature must be allowed for.
- IV. **Chemistry:** one paper of 3 hours, with 6 questions out of a choice of 10.  
*For example:* Give a full description of chemical tests, *one* for each pair of substances, that would enable you to distinguish between the members of *five* of the following pairs:
- carbon and manganese dioxide  
 sodium nitrate and sodium sulphate  
 metallic zinc and metallic lead  
 oxygen and nitrous oxide  
 sodium carbonate and sodium bicarbonate  
 ferrous sulphate and ferric sulphate.
- V. **History:** one paper of 2½ hours. The paper is divided into 12 sections: 7 sections on English history from 55 B.C. to 1931, and 5 sections on European history (and the development of the Commonwealth) from 1500 to 1933. Five questions in all chosen from any two sections must be answered.  
*For example:*
- (1) In *English History*, 55 B.C. to A.D. 1216. What was Domesday Book? What do we learn from it about English life during this period?
- (2) In *English History*, 1763 to 1832. Explain the reasons which led the American colonists to issue the Declaration of Independence.



effectively, by means of grouping like with like in courses of varying difficulty. Special efforts and experiments are being made to improve the selection processes; it is likely that the practice of providing in secondary modern schools special courses leading to the General Certificate of Education examination for students whose scholastic ability develops late will be greatly accelerated. In the period 1954-57 alone the number of secondary modern students remaining at school to take the GCE examination more than doubled. A further experiment is with comprehensive secondary schools, more on the US pattern, where the child finds his own level, whether in the scholastic stream or in technical training or again in less ambitious pursuits.

## II. THE GENERAL CERTIFICATE OF EDUCATION

It has long been the practice for public examinations to be held annually in secondary schools and for the same exam system to cover state supported and private schools alike. In England and Wales they are conducted with the approval of the Ministry of Education by examination boards set up by the Universities. Similar public examinations are conducted in Scotland and Northern Ireland. In England and Wales, the recognized external examination is the General Certificate of Education (GCE). This came into being in 1951 replacing the former system of setting two examinations, known as the Higher Certificate and the School Certificate.

The new examination was established with the intention of defining the standards reached in particular subjects at a stage as late as possible in the secondary school course, primarily with a view to meeting admission requirements to a university or to courses of study in other institutions of higher education, such as technical colleges or training colleges for teachers or to professional training.

The examination papers are set at three levels: Ordinary, Advanced and Scholarship. The Ordinary papers are designed to provide a reasonable test in a subject for pupils who have taken it as part of a wide and general secondary course up to the age of at least 16. The order of popularity of subjects in the middle school can be deduced from the number of entries at Ordinary level in the GCE and is as follows: English language, mathematics, English literature, French, geography, history, science, art, Latin.

For many pupils the first GCE examination marks the end of their school career, but the tendency to continue at school in order to spend a year or two in the Sixth Form has grown steadily of recent years, and the proportion has now risen to about 40 per cent.

## *GCE Examination—Advanced Level*

### I. Pure Mathematics: 2 papers of 3 hours each.

*Paper 2.* Eight questions out of a choice of ten. *For example:*

Verify that, for all values of  $n$ , the point P ( $a \cos n$ ,  $b \sin n$ ) lies on the ellipse  $x^2/a^2 + y^2/b^2 = 1$ .

The tangent to this ellipse at P meets the  $x$ -axis at T. N is the foot of the perpendicular from P on to the  $x$ -axis and NP produced meets circle  $x^2 + y^2 = a^2$  at Q. Prove that the tangent at Q to this circle passes through T.

If the circle PQT touches the  $x$ -axis at T, show that  $\tan^2 n = b/a$ .

### II. English Literature: 3 papers of 3 hours each.

*Paper 1.* Prescribed texts of Chaucer and Shakespeare. Five questions must be answered, including at least two from the Chaucer section and two from the Shakespeare section. *For example:*

By close reference to his descriptions of three or four pilgrims, show how Chaucer varies his method of characterization in *The Prologue*. *Paper 3* consists of passages in verse and prose which are designed to test the candidate's ability to elucidate their meaning and to show his appreciation of their literary form and content.

### III. Physics: 2 3-hour papers, and one 3-hour practical test. In the written papers candidates are asked to answer six questions out of eleven.

*Paper 3. Practical.* 2 exercises are required, in 3 hours.

Find the shortest lengths of the air column in the resonance tube provided (it is partially blocked at the open end) for which resonance is obtained with a series of five different forks of known frequencies. Plot your observations so as to obtain a linear graph and from it determine the end correction of the tube and the velocity of sound in air at room temperature.

### IV. Chemistry: 2 3-hour papers, and one 3-hour practical test. In the written papers, five questions out of ten in each are required.

*Paper 1.*

Write graphic formulae for compounds containing an alkyl radical attached to (a) the primary alcoholic group, (b) a secondary alcoholic group, (c) the carboxyl group, (d) the primary amino group. State briefly, giving examples and equations, the characteristic reactions of these compounds.

### V. History: 3 papers of three hours each.

*Paper 1A—English History—Period 450 to 1922* divided into 6 sections. Students must answer 5 questions out of 12 in any one section.

*Example:* Period 1714-1815.

Can you justify the view that the attitude of the British government towards the American Colonies, during the years 1763-76, was "stupid, perverse and blind"?

*Paper 3—Special Subject—Special knowledge required of one of a number of episodes or subjects. 4 questions out of a choice of 10.*

*Example:* The History of the British Empire during the Reign of Queen Victoria.

Distribute responsibility for the outbreak of the Second Boer War (1899-1902).

The Advanced papers are designed to provide a reasonable test of those subjects in which students have specialized during two or more years of Sixth Form Study. At the Advanced level it is possible to gain a Distinction mark. The age range in the sixth form is roughly equivalent to the eleventh and twelfth grades and the curriculum is markedly specialist in character. It is narrowed to about five subjects of which the student will specialise in three, devoting about two-thirds of the working week to them. Typical combinations of special subjects are mathematics, physics and chemistry; mathematics, further mathematics and physics; English, French and Latin, English history and Latin. The choice of subjects tends to divide the Sixth Form into two sides, the science side and the arts side. It is estimated that about 60 per cent of all Sixth Form students are currently studying on the science side. This is borne out by the choice of subjects by candidates for the GCE at the Advanced level, which is usually taken two years after sitting for the Ordinary level, the order being, physics, mathematics, chemistry, English, history, French, biology, geography, Latin.

Scholarship papers are designed to give specially gifted students an opportunity for showing distinctive merit and promise. The essential difference between Scholarship and Advanced level lies in the nature of the questions set; they do not necessarily cover a substantially wider field of study. Successes in the Scholarship papers provide criteria for making the awards of State and local education authority scholarships at the universities. At the present time 75.7 per cent of the students at British universities receive some form of scholarship assistance.

All subjects at each level are purely optional, the candidate taking the subjects of his choice at the level of his choice. There are no group or minimum requirements for the Certificate, which records the subjects and levels at which the candidate has satisfied the examiners. However, although the Universities' admission requirements vary, it is broadly correct to say that they require a GCE showing 5 or 6 passes of which at least 2 are at the Advanced level. Faculty and departmental requirements often require Advanced level in the subjects the student wishes to pursue for his degree.

The papers demand more than can be completed, except by the best candidates, in the time allotted. Qualitative or descriptive answers, giving scope for expressions of opinions and judgment, are commonly required and it is the practice of the examiners to mark them with some severity. There are practical as well as written tests in the scientific and certain other subjects and an oral examination when a modern foreign language is taken.



*"Never has the human mind been master of so many facts and sure of so few principles."*

## Facts About British Universities

The swing to science, everywhere apparent, is perhaps responsible for the very prevalent criticism of higher education today, epitomized in the above quotation from a paper\* by Sir Keith Murray, Chairman of the (British) University Grants Committee.

But before looking at some facts which Sir Keith has himself provided, it is worth observing that in our two countries today no-one supposes that science, unlike moral philosophy, is somehow divorced from questions of principle: the British universities strive hard, in the face of endless demand for more trained men, to preserve their academic standards whether in the arts or the sciences; and in spite of a relatively huge increase in the student population since the war (and its expected further growth in the next decade), the university trained population is kept down to a relatively small section of the population as a whole. One factor is the selection requirements over which the universities keep complete control; another is the availability outside the universities of many institutions competent to give the technical training, qualifying diplomas and status sought by students, in for example, accounting, architecture, various forms of engineering, electronics, crafts or trades of all sorts from the humblest to the most skilled.\*\* The line between universities and technical schools becomes a thin one in places and as respecting differing academic standards may disappear altogether in some instances, but technical colleges rather than the universities provide almost three-quarters of Britain's men and women with professional qualifications.

Sir Keith Murray's paper, referred to above, gives these useful facts on the British universities. They are worth bringing together:

### *Which are the universities?*

He names 21 universities and three separate colleges which are recognized in the sense that they are eligible for grants of public money.

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\*The "Development of the Universities in Great Britain": *Journal of the Royal Statistical Society*, Vol. 121, part 4, 1958.

\*\*See articles on scientific and technical training in *British Affairs*, March 1957 and June 1958.



As universities they are grouped by type and, as it happens, in chronological order in terms of the dates of their charters as follows:

1. Oxford and Cambridge Universities.
2. The Scottish Universities: St. Andrews, Glasgow, Aberdeen and Edinburgh.
3. London, Durham and the University of Wales, "Federal" Universities consisting of thirty-nine, two and five constituent parts respectively.
4. The larger civic universities—Manchester, Birmingham, Liverpool, Leeds, Sheffield, Bristol and Nottingham.
5. The smaller civic universities—Reading, Southampton, Hull, Exeter and Leicester.
6. The Manchester College of Science and Technology and the Royal College of Science and Technology, Glasgow, whose students take respectively the degrees of Manchester and Glasgow Universities.
7. The University College of North Staffordshire.

#### *Size of Universities (1956-57)*

London has 19,762 students, Oxford 7,708 and Cambridge 8,389. Of the rest, and counting separately the constituent parts of Durham and Wales, none has over 6,000 students while 16 have under 2,000.

#### *Total size of student body*

Student population (October 1957)	94,000
This compares with 1938-39	50,000
1945-47	85,000
1953-54	81,000
<i>Prospective growth:</i> 1965	124,000
1970	136,000

#### *Wastage and failure rate*

Of the 1952-53 enrollment in arts, pure science and technology 80.6 per cent passed their final degree exams; 5.4 per cent left for non-academic reasons and 11.3 per cent left for reasons of academic failure.

#### *Staff-to-student ratios (excluding Oxford and Cambridge)*

1938-39	1:10.2
1956-57	1: 7.2

#### *Subjects taken*

(1955-56) Arts took 43% of total student numbers, pure and applied science 57%. Of the latter figure 37% was pure science and technology, 20% was medicine, dentistry, agriculture and veterinary science.

The numbers taking all science subjects have risen from 27,000 in 1938/39 to 54,000 in 1957/58. In the expanded program (1955-65)

some two-thirds of the increase will take place in pure science and technology, about one-third in arts, while numbers studying medicine, agriculture, etc. will remain roughly the same.

### **Residence**

The percentage of students living away from home (in college or lodgings) had risen from 49% in 1950 to 72% in 1957.

### **Assistance from Public Funds**

Public funds as a percentage of all university income has risen from 30.9% in 1938 to 68.4% in 1955/56. *Capital* expenditure from public funds has risen from about £100,000 a year in 1938 to £7,082,000 in 1955/56.

The proportion of students in receipt of grants and scholarships (whether from private or public funds) rose from 41.1 per cent in 1938-39 to 75.7 per cent in 1956-57.

## Float Glass

The British firm of Pilkington Brothers Ltd. has developed a revolutionary new process that combines the best properties of plate glass and fire finished sheet glass to give a distortion-free product without the costly grinding and polishing hitherto necessary. The product—"Float" glass—is the result of seven years' intensive research at a cost of £4,000,000 (\$11,200,000).

The process, fully patented, consists of a continuous ribbon of glass passing from the furnace to float on the surface of a molten metal at controlled temperature, emerging with a brilliant lustrous finish on both sides.

Sir Harry Pilkington, Chairman of the Company, says there are three main technical advantages of the process:

- (1) it makes glass which is exceptionally parallel and free from distortion.
- (2) it produces glass with fire polished surfaces of better quality than that achieved by grinding and polishing.
- (3) it is absolutely continuous.

For the moment, the new glass is being produced in limited quantities, but when output grows, the more economical process will have a favorable effect on both the price and quantity of high quality glass. Eventually it should mean better and cheaper glass for automobiles, buildings, display windows and mirrors.

*Scotland has attracted much American investment in postwar years. An account of US companies in the Glasgow area and their contribution to Scotland's and Britain's economy is timely in view of the Scottish Industries Exhibition to be held in Glasgow in September.\**

## Progress Report: US Investment in Scotland

The thirty American-owned industrial firms in the Glasgow area had a peak year in 1957 for production, factory construction and exports. The wave of new US firms, which reached a crest in 1956 subsided decisively to one newcomer in 1957. The rise in production of 26 per cent by value to £47,748,400 is a measure of these firms' markets and the progress in getting factories into production. Employment in their plants rose to 29,475. The construction of new factories and the expansion of old ones involved more than half of the total US investment in this area with an estimated value of over \$938 million. Newly completed factories included earth-moving machinery, office machines, automobile tires, petrochemicals, and distilleries. The electrical manufacturing industry which completed new plants in 1955-56 increased production by 40 per cent in 1957.

Export markets took 60 per cent of all production, £28,431,000. An improved domestic market for earth-moving machinery and coal-mining machinery can be ascribed largely to the requirements of the National Coal Board. The recession in world markets, however, caused production of office machines to level off.

Factory construction and expansion involved investment programs totaling £20,744,850, as compared with a total of £33,533,000 for all US investment in the area. The year's construction should be regarded as part of the second phase of American investment in Scotland, which began in 1956, continued at a construction peak in 1957, and requires further tool installation in 1958.

This second phase is characterized by the predominance of independent factory construction, as compared with the first phase of 1946-55, when the inducement of cheap subsidized factory space on the Scottish Industrial Estates (SIE) was a primary attraction. Considerable invest-

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\*By Samuel O. Ruff, until recently US Consul in Glasgow. The article was first published in *Foreign Commerce Weekly* and reprinted in *Anglo-American News*.

ment, however, was devoted to the expansion of factories on the SIE, and additional investments were made by plants already in operation.

Seven new factories represented an investment of over £17 million. Factory expansions on the SIE in seven other US-owned plants and improvements in four more accounted for the remainder.

The 20 US firms which set up in Scotland in the postwar period prior to 1956 all rented factory space at nominal rates, generally one shilling and six pence per square foot, from SIE. When the credit squeeze was applied at the end of 1955, the Board of Trade (BOT) cut to a minimum the funds available for building factories for rental. A new policy gave priority to firms already on the estates which had committed themselves to phased expansion and to which the BOT had made commitments. Consequently, the BOT was unable to grant factory space to a new firm but was able to award an aggregate of factory space to old firms equal to that of previous years.

Fourteen of the 21 American firms in the Glasgow area are engaged in light or medium manufacturing. There were important introductions in 1957 in such highly different fields as whisky distilleries, rubber tires, and petrochemicals. The light manufacturing firms with a total production value of £32,962,000 include manufacturers of: three for office machines, one for sewing machines, six for electrical manufacturing (motors, thermostats, controls, terminals, household appliances), one for clocks, one for razor blades and three firms engaged primarily in assembly and repair. The value of their total output increased in 1957 by 13.5 per cent over the 1956 total.

The manufacturer of sewing machines is the oldest and largest American firm in Scotland with a total of 14,000 employees. The value of its production is considerably larger than that of the other groups. The firm has largely rebuilt its plant following bombing in World War II and has completely retooled its models for a global market where it holds its own against stiff competition from Switzerland, Italy, Germany, and Japan. The rise of its production by 146 per cent since 1946 is a measure of its production recovery.

#### PRODUCTION INCREASES

The electrical manufacturing and household appliance industry registered the sharpest increase in production, 40 per cent. These statistics reflect the success of these firms in getting into full scale production during the year. The makers of thermostats and industrial controls showed the greatest gains, while new production figures for electric



shavers and household appliances accounted for the rest of the change. Export markets remained strong.

The recession on world markets directly affected the office machine market and leveled off its perennially rising output to a mere two per cent. Sales for standard models were off on both domestic and foreign markets. Sales declines of standard models, however, were offset by a steady market for special machines such as electric typewriters and portables. These firms have therefore been able to cut delivery date from six months in 1956 to six weeks at the end of 1957. This drop in demand has had no effect on the important expansion programs of two of the firms. One is ready to move into its new 300,000-square foot factory for making accounting machines; the other has just received 50,000 square feet from SIE for the expansion of plant for making computers.

Machinery investment in seven medium engineering factories in the Clyde valley includes two manufacturers of earth-moving machinery, one for earth-moving machinery engines, one for winches for earth-moving machinery, two for mining machinery and one for machine tools. The value of production in 1957 for this group was £9.6 million, an increase of nearly 50 per cent over the 1956 total.

Production by the earth-moving machinery industry, and its allied firms, for 1957 was up 39 per cent. Its total employment was 1,165 and its exports totaled £4,687,500. Although 75 per cent of all production goes for export, the domestic market was very strong in 1957 because of the requirements of the National Coal Board for open cast (strip) mining.

This industry's activity in construction and expansion in 1957 was probably even more important than its production. The four firms are directly engaged in the investment of £7,803,000 for plant construction and tool installation. Productive area and capacity will be at least four times greater when these firms finish their tooling up.

The earth-moving machinery industry can be cited as a most successful introduction of an American industry into the British economy. The American firms gave consideration to the entire range of factors—government relations, raw materials, siting, labor, markets, and effect upon the local economy.

The selection of the Glasgow area enabled the firms to make use of raw materials and skilled labor already on hand. The firms were successful in enlisting the cooperation of Colvilles, the local steel group, to include their requirements for high carbon steel plate in calculations for expansion of the Hallside works in Lanarkshire. They cooperated with the Board of Trade in selecting sites in Lanarkshire, an area with an

acute employment problem caused by the exhausting of the coal mines, and therefore having a good supply of labor. These firms have a good effect on the local economy because they spend 62 per cent of their production costs on local supplies, thereby providing a firm demand for the products of machine shops, sheet metal shops, and foundries in this area. Their exports make them a net asset to the British balance of payments. This export market is likely to remain strong since it is closely related to the development programs in the underdeveloped countries which in most such areas hold a priority on available foreign exchange.

#### DOMESTIC MARKETS

The prospects of the domestic market are particularly bright because of the requirements of the National Coal Board, the construction industry, and the road-building program. With the priority given to the new road-building program, the Ministry of Transport has recently let the largest contracts in its history for important trunk roads—super highways. These firms have the bulk of the American personnel in Scotland (outside of the USAF) and carry a strong flavor of the Middle West with them from Peoria, Cleveland, and Indianapolis.

The two firms which make coal-mining machinery had a strong market in 1957 because of the requirements of the National Coal Board. The NCB in Scotland required system mining machines for the mechanization of its three new collieries in Fife, at Rothes, Kinneal, and Glenochil. Further south, the Board is using the drilling machines made by the other firm for prospecting and open cast mining.

The first US machine tool firm in this area arrived in Scotland in 1957 and has its plant under construction. Its selection of the Glasgow area is also related to the supply of steel plate made available by the expansion of the Colville Steel group.

Three new firms, representing an investment of £10,785,714, stand out prominently from the rest of the nine miscellaneous firms because they had new factories in production by the end of the year. The Consulate's survey of 1956 reported the arrival of two new American firms in Scotland for the manufacture of rubber tires and polyethylene. The manufacturer of rubber tires achieved a 60 per cent rate of capacity by the end of the year. The chemical firm completed its £4-million installation, located in the petrochemical complex of industries at Grangemouth, and began producing high-pressure polyethylene on the night of December 30, 1957. The American entry into the Scottish whisky industry in 1957 was marked both by the outright purchase of distilleries already in production and an investment program in new distilleries. This debut

is of considerable importance since the distilleries already in production had produced in 1957 a total equal to 25 per cent of British whisky exports.

The six miscellaneous firms already in production showed great consistency with the previous year in terms of production, labor, and exports.

## Industry on the Move

Special measures were taken in 1958 to encourage industry to expand in certain areas where unemployment is rather higher than the national average. These areas, called DATAC Areas from the Development Areas Treasury Advisory Committee, are extensions of the post-war Development Areas, created by the Distribution of Industry Act, 1945, which themselves were an extension and expansion of the Special Areas created by the Special Areas (Development and Improvement) Act, 1934.

Unemployment in post-war years has continued to be at a low level, and it has been for some time evident that the Development Areas as a whole are no longer so much worse off than the rest of the country that they need special treatment. Some parts of the Development Areas have continued to have unemployment at a level substantially higher than the national average, but others have become reasonably prosperous. On the other hand a number of pockets of intractable unemployment have emerged outside the Development Areas.

Thus in 1958, Britain took powers under the Distribution of Industry (Industrial Finance) Act to extend to all places of high unemployment, whether within or outside a Development Area, the provision of the 1945 Act enabling the Treasury to grant financial assistance on the recommendation of DATAC. The criterion to be used is whether there exists in these places a high rate of unemployment which is likely to persist and whether the project will reduce such unemployment.

*Northern Ireland* offers quite special inducements to new industries. An automatic annual grant towards the cost of equipment and buildings has been increased from 25% to 33⅓% this year (1959). Factories with all services laid on are available, or will be built to order with the assistance of special financial terms. Rentals can work out as low as 10¢ per square foot a year for the first ten years. Over 130 British and American firms have set up in Northern Ireland since 1945.



*The British Parliament must be dissolved every five years. The next election must take place by June 1960. But Parliament may be dissolved any time. An election is then held.*

## British Electoral Procedure

### A BACKGROUND TO GENERAL ELECTIONS AND THE BRITISH POLITICAL STRUCTURE

The British Parliamentary structure has evolved into a two party system of "in and outs" only in the last hundred years. Before that time, party factions certainly existed—they came and went—and clear lines were drawn on great issues—like the American war of Independence or Catholic emancipation—but there was little party discipline in the modern sense, and as the Duke of Wellington observed in 1830 "... the opposition generally speaking is *personal*." Loyalty too, centered round individuals or the causes they championed. After the great 19th Century electoral reforms which brought about the enfranchisement of the male public (women only got the vote in 1918), political organization began to form around the party leadership, not only to secure party voting in Parliament, but to mobilize the electorate.

In Britain as in the United States, the party system has become an integral part of Parliamentary democracy. Today, the two main parties are the Conservative Party and the Labour Party. After the general election the leader of the party which wins the majority of seats (though not necessarily the majority of votes) is traditionally called upon by the Sovereign to form a government. The majority party forms a cohesive team in support of the government thus making day to day administration possible; the other party forms the official opposition, which also has its own formal entity, its "Leader" and its "shadow Cabinet."

#### "M.P." OR REPRESENTATIVE?

The voter does not vote for the Party, for the Prime Minister or for the other officers of state. He votes only for his own Member of Parliament. The Prime Minister himself is technically no more than a parliamentary candidate on election day, facing the voters in his own constituency, and although the various candidates may have the full backing of their respective parties, the ballot paper which the voter marks may not show the party affiliation of the candidates listed on it.



There may be some significance still in the distinction between the term "Member of Parliament" and "Representative" or "Deputy" used in so many democracies. It epitomizes a theory of Parliamentary Government laid down by some of the great 18th century jurists—that the member is sent to London to help to govern the country as a whole, not to represent his constituency interests solely. A member must in practice give a great deal of time to the complaints and concerns of his electors, but his main job is to be a member of the sovereign Parliament, whether he is supporting or is in opposition to the Government of the day, and to do so until election time, when he must account for his stewardship.

#### ELECTION ARRANGEMENTS

The maximum legal life of a British Parliament is five years, but there is no fixed electoral period. If the Government of the day is out-voted in the House of Commons on a major issue, or the Government itself thinks it advisable to seek a vote of confidence from the electorate to continue its policy or before embarking on a new one, then traditionally, the Prime Minister may ask the Crown to dissolve the old Parliament, call a new one and issue Writs of Election. There have been a few occasions when a new Government has been formed without an election taking place: the tone of opinion in the country and in the House of Commons may dictate a clear recommendation from the Prime Minister that the Sovereign should call upon the Leader of the Opposition to form a government forthwith.

For electoral purposes Britain is divided into constituencies each representing about 60,000 voters. All are single member constituencies, returning one member only to the House of Commons. Four Permanent Boundary Commissions, one each for England, Wales, Scotland and Northern Ireland, keep constituencies constantly under review and submit periodic reports. Changes in the boundaries of constituencies which came into effect for the 1955 General Election increased the number of seats in the House of Commons from 625 to 630.

#### WHO MAY VOTE

Every British subject (i.e. citizen of the United Kingdom and Colonies and citizens of the sovereign countries of the Commonwealth if they so opt) resident in a constituency, who is of full age, i.e. 21, and whose name is on the register of electors, is qualified to vote. So, too, are citizens of the Republic of Ireland under the same conditions. Voting is not compulsory. In the 1955 election 76.8 per cent of the electorate voted. Disqualified from registering and therefore from voting are: peers (who have a right to a seat in the House of Lords), lunatics,

felons (although this disqualification does not apply in Scotland) and persons convicted within five years of corrupt or illegal practices in a previous election. Members of the armed forces and servants of the Crown such as Embassy and Consular officials and their dependents resident abroad may make a Service declaration and vote by proxy. Certain persons, such as the blind, the physically incapacitated and those prevented by the nature of their work from getting to the poll, may apply to be treated as Absent Voters and vote by mail or, in certain cases by proxy.

Each constituency has its election registration officer, usually the Clerk to the Local Authority. It is his responsibility to draw up the yearly Parliamentary Register. This is usually done by a house-to-house canvass. The Register must not carry any indication of an individual's party affiliations. Expenses in connection with the compilation of the electoral registers are borne equally by the Government and the Local Authority.

In each constituency a Returning Officer who may be the Mayor, Sheriff or Chairman of the Local Council, is appointed. The Returning Officer is responsible, under pain of severe penalties, for conducting the election in accordance with the statutory rules which are very strictly enforced.

#### THE CANDIDATES

Anyone who is qualified to vote is also qualified to stand for election with the exception of the clergy of the established churches in England and Scotland, Catholic priests, persons holding offices of profit under the crown, such as civil servants, members of the armed forces, and holders of judicial office. A candidate need not be a resident of the constituency for which he stands.

Methods of selecting candidates vary. The local party association and the national organization may both be involved. The candidate is finally "adopted" by the local association. A "prospective" candidate is often adopted several months before an election is likely to take place, in which case he usually busies himself with local affairs, "nursing" his constituency.

There is nothing to stop anyone standing as an Independent, so long as his nomination papers, like those of a regular candidate, bear the signatures of two electors, a proposer and a seconder, as well as the names of eight registered electors of the constituency assenting to his nomination. However, to ensure that only candidates of serious intent seek nomination, the candidate has to deposit £150 with the Returning Officer. The £150 is returned to him if elected, or if he polls more than

one-eighth of the total votes cast; if not, he forfeits his deposit to the crown.

#### THE ELECTION CAMPAIGN

The proceedings at elections are conducted according to a time-table laid down by law and the campaign itself cannot last for more than three weeks. The Royal Proclamation dissolving Parliament opens the campaign, but the approximate date of an election, unless the Government falls, is often known some time in advance, and various official campaign activities may start some months beforehand.

Pamphlets, posters and leaflets are prepared by the national party associations, and each party and candidates hold a large number of small local meetings and a few large rallies. Under special arrangements worked out between the political parties and the British Broadcasting Corporation time is allocated to each of them. In the 1955 election the Conservative and Labor Parties each had 4 sound broadcasts of 20 minutes, 3 television programs of 30 minutes and 2 of 15 minutes, while the Liberal Party had one sound broadcast of 20 minutes and one television program of 15 minutes. The parties naturally reserve these programs for their most effective speakers. The Independent Television Authority was not in existence at the time of the last General Election, but it will probably be included in any arrangement which may be made for the next election.

At the constituency level each candidate develops his own organization. Unless he is an independent the local party organization is his basis. An election agent must be appointed for each candidate to be responsible for all expenditure and activities connected with the candidate's election. A candidate may act as his own election agent. He or his election agent rents committee rooms (which may not be situated within his own property or premises licensed to sell liquor), recruits a staff of volunteer workers and prepares and distributes campaign literature. If non-partisan organizations wish to support a candidate they must do so on a volunteer basis only. Each candidate is allowed to mail free of charge to each registered elector one postal communication connected with the election and not exceeding two ounces in weight. This usually takes the form of a letter containing a statement of his policy or platform (called the election address).

#### ELECTIONEERING EXPENSES

The expenses of candidates are carefully regulated by law. The present limits are as follows: £450 (\$1260), plus in county constituencies an additional 2 pence (just over 2 cents) for each elector, and



in borough constituencies a penny half-penny for each elector. Each candidate is also allowed to spend a sum not exceeding £100 (\$280) on his personal expenses, including money spent on travel and hotels. All money spent for the promotion of a candidate, from whatever source, must be paid through the election agent, and he is required by law to account for it. The accounts are audited by independent experts. Failure to render an account or an incorrect return may invalidate the election. These provisions do not apply to the amounts spent by the national party organizations for general publicity during the campaign.

#### THE POLL

The polling stations are open from 7 a.m. to 9 p.m. on election day. An official poll card is sent to each elector, setting out the date and hours of the poll and the situation of his polling station. The voter applies to the presiding officer for a ballot paper by announcing his name. At no time is any mention made of his party affiliation, if any. The voter's electoral number is entered on the counterfoil of the ballot paper and the ballot paper is then stamped with the official stamp. Only ballots carrying this stamp are valid. The voter enters a screened booth to mark his ballot in secret and then places his ballot paper himself in the sealed ballot box. No voting machines are used. The voter merely marks his paper with an X against the name of the candidate of his choice. Any other marking or writing invalidates the ballot. The candidates' names appear without party designation, arranged alphabetically in the order of the surnames.

As soon as the polls are closed the sealed ballot boxes are all taken to a central office for the counting. The only persons present are the Returning Officer and his assistants, the agents of the candidates, the candidates and the candidate's husband or wife. No public announcement is made until the counting is complete, so the custom of "conceding elections" does not exist. The Returning Officer declares the candidate receiving the highest number of votes elected, regardless of whether he had received a majority of the poll. When the voting is very close a candidate may ask for a recount and further recounts. If the number of votes cast for the leading candidates is equal, the result after a recount, is decided by lot.

The results of the 1955 election:

	<i>Seats Gained</i>	<i>% of Votes Cast</i>
Conservatives and Supporters	345	49.8
Labor and Cooperative	277	46.3
Liberal	6	2.7
Communist	—	0.1
Others	2	1.1



# The British Economy: Background To 1959

As another Budget year ends (the British financial year runs from April to March) a spate of comment and advice is poured out in Britain on how the authorities should seek to direct the economy in the coming year. Before turning to the most recent background, it may be worth setting in perspective the rather breathless pattern of the last few years.

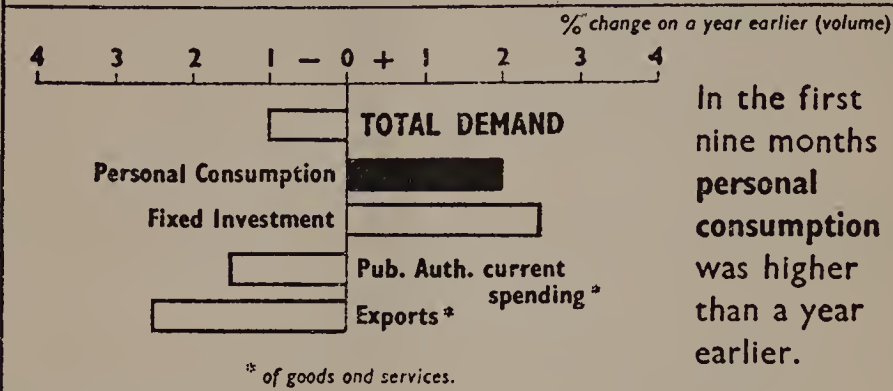
Today, it is generally agreed that the British economy is in better shape than for many years; but since 1955 it has swung through all possible phases from over-extended resources and fears of runaway inflation to a perceptible under-employment of resources accompanied by price stability (and talk of economic stagnation by the political opposition) in 1958. Other countries can point to similar swings of fortune: what may be of special interest to overseas observers is the close coupling of Britain's domestic fortunes to her balance of payments with other countries and therewith the movement of her reserves of gold and foreign currencies.

For example, inflationary pressures in the early fifties showed up in a shortage of goods for export, excessive domestic consumption of imports and a consequent external deficit, weakness of sterling and loss of gold. The Government had to correct this trend by acting on the domestic economy. It is worth remarking that domestic trends, whether towards inflation or disinflationary, are difficult to detect in time for effective action; while the external figures are visible from day to day and in a country as dependent as Britain on foreign business can be ignored at their peril. It is worth remarking too that so greatly does Britain's strength depend on foreign trade and international currency movements that domestic policy decisions have to be shaped largely in the light of such external factors. For years Britain has been obliged to discipline her internal development so as to conform with these external demands.

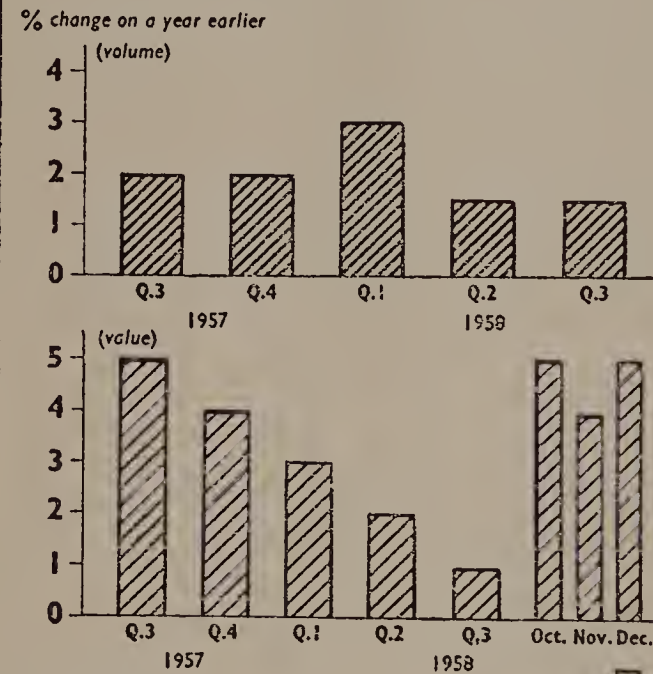
## THE PHASE OF THE CREDIT SQUEEZE

It was in the summer and fall of 1955 that the Government launched the major attack against overexpansion at home by operating on the supply of money credit—by limiting bank lending, expansion by busi-

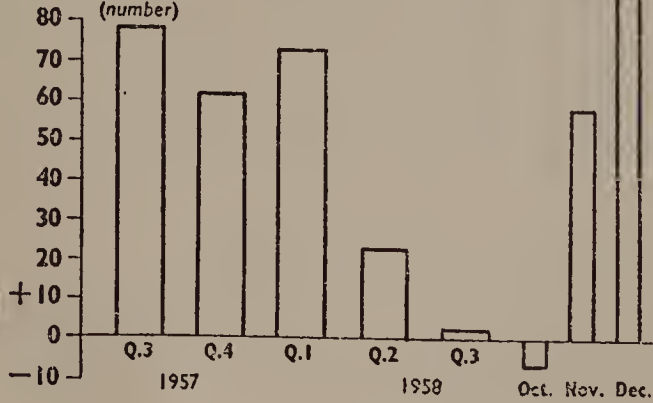
# THE HOME CONSUMER MARKET



In the first nine months personal consumption was higher than a year earlier.



But the increase in personal consumption had been slowing down.



In the fourth quarter there was a marked revival in retail trade...

...and H.P. sales of new cars were unusually high.

ness enterprises and purchases by the individual consumer. From that time, the "credit squeeze" was applied with varying intensity until the summer of 1958. Its high point, marked by a 7% bank rate, came in the fall and winter of 1957/58. Since then the steady improvement in the external balance has permitted a relaxation of stringent domestic policies.

Without any attempt to attribute a casual connection between these parallel internal and external developments, it is nonetheless revealing to set down the way in which the reserves moved over this period in relation to bank rate, whose movements broadly reflect the tempo of this domestic credit squeeze.

## THE BANK RATE AND THE RESERVES

		<i>Bank Rate %</i>	<i>Reserves (\$ mn.)</i>	
1955	January 27 .....	(from) 3 to 3½	2,763	Jan. 1955
	February 24 .....	4½	2,681	Feb.
1956	February 16 .....	5½	2,210	Feb. 1956
1957	February 7 .....	5+	2,147*	Feb. 1957
	September 19 .....	7	1,850	Sept.
1958	March 10 .....	6	2,770**	March 1958
	May 22 .....	5½	3,039	May
	June 19 .....	5	3,076	June
	August 14 .....	4½	3,089	Aug.
	November 20 .....	4	3,215	Nov.

\*includes \$561 million from IMF (Dec. 1956) (still to be repaid)

\*\*includes \$250 million from Ex Im Bank (still to be repaid)

+ a technical adjustment in response to market conditions

It will be seen that 1958 witnessed a real turn-round in Britain's external fortunes. Not only did bank rate start coming down, but many other restrictions came off—e.g. those on instalment buying, on personal loans and on industrial credit. At the same time, as the situation improved, restrictions on the use of sterling overseas were removed; in this way the pledge of successive British governments has been redeemed: greater freedom of commerce and internal payments has followed directly on the improvement in Britain's external balance.

It may not be possible to attribute cause and effect to the changes that have taken place in the past three years in overseas developments and in the government's domestic policy. It is pointed out that the main factor in Britain's improved external position has been the fall in commodity prices: it is claimed by some that cyclical factors still operate and predominate—making our economies expand now faster, now slower: but it is also generally agreed that no one factor or act of policy can be the final determinant in a situation in which so many factors operate, and this being so, no one will dispute that government policy is one major factor (and the absence of government policy can be another) which shapes the picture as a whole.

### *An Estimate of Trends*

The always tricky problem of interpreting economic trends has been helped in Britain this year by the introduction of a new series of studies of the economy which are to appear every two months from a highly reputable non-governmental source. The first issue of the "Economic Review" prepared by the National Institute of Economic and Social Research (reviewed elsewhere in *British Affairs*) summarizes the outlook somewhat on these lines:

*Britain is beginning to emerge from a slight recession brought about mainly by reduced stock-building and by a fall in exports. At home easier credit conditions have stimulated sales of durable goods. The fall in stocks has pushed production down but should soon be reversed—new ordering should follow.*

*Industrial production is now no higher than in 1955 and there is enough unused capacity and labor to permit a rise of 10-15% in two years without engendering dangerous inflationary pressure.*

*Three fifths of Britain's exports are to primary producing countries and depend on the earnings of such countries. These should not fall much further but they are unlikely to rise much until renewed expansion in the manufacturing countries raises demand for primary products.*

*A fall in private investment is expected (if only because of its rapid rise in the past four years). This should be offset in 1959 by a rise in public investment and government expenditure. These small changes will not raise output much above the 1957 levels and employment will probably rise less than production.*

*Imports will probably rise more than exports and result in a current balance of payments surplus less than last year's (but still good at about £200-300 million.)*

*If the Government decides to raise demand the quickest way is to raise consumer demand. But if little can be done by Government action to raise private investment or exports immediately, there are still opportunities for more social investment (hospitals, education, etc.) and for public basic investment (roads, power and steel)—all of which have been limited in their growth by the need to ration resources since the war.*

The chart opposite shows how the Government collects each £ of revenue and how it spends each £ it collects. The figures relate to 1958-59 (ending March 31). The 1959-60 Budget to be laid before Parliament on Budget Day in April will use these 1958-59 figures as a basic guide to estimating new revenues and expenditures. The figures 6/5, 5/3, etc. refer to shillings and pence. Thus 6/5 is six shillings and five pence in the £, or just over 32 per cent. The surplus shown on the right of the chart, together with money the Government borrows, is used to meet expenditure "below-the-line" (not shown on chart which gives "above-the-line" details only). "Below-the-line" expenditure includes loans to nationalized industries, local authorities, and the Post Office, and for colonial development.



## THE NATIONAL BUDGET 1958-59

REVENUE  
Receipts per £ from different sourcesTAXES ON INCOME AND  
CAPITAL 10s. 8d.

Taxes on Personal Incomes:  
Income Tax and Surplus,  
Including tax on  
dividends and interest  
(£1,750 million)

6'5

Tax Paid by Companies:  
Income Tax, Profits Tax  
and Excess Profits Levy  
(£1,000 million)

3'8

Estate Duty  
(Death Duty)  
(£164 million)

7d

## TAXES ON SPENDING 8s. 8d.

Tobacco  
(£740 million)

2'9

Alcohol  
(£428 million)

1'7

Entertainments & Betting  
(£51 million)

2d

Purchase Tax  
(£490 million)

1'10

Oil and Motor Duties:  
Oil, including petrol (£345 million)  
Motor (£104 million)

1'8

Stamp Duties,  
Import Duties (except on  
alcohol, tobacco, oil), etc.  
(£191 million)

8d

## NON-TAX REVENUE 8d.

Broadcast Licences, Receipts from  
Loans and Govt. Trading, etc.  
(£176 million)

8d

Total £5,439 million £1.0.0

EXPENDITURE  
Outlay per £ on different itemsDEFENCE AND NATIONAL  
DEBT 7s. 11d.

Defence  
(£1,435 million)

5'3

National Debt:  
Interest on Government  
Stocks, including  
National Savings Certificates  
(£733 million)

2'8

## SOCIAL SERVICES, SUBSIDIES, ETC. 8s. 1d.

Health Service  
(£557 million)

2'1

Education  
(£484 million)

1'9

Personal Payments: Family  
Allowances, War Pensions,  
National Assistance,  
Govt. Contribution to  
Insurance Funds  
(£506 million)

1'10

Agricultural and  
Food Subsidies  
(£296 million)

1'1

Assistance to Local  
Authorities for Housing,  
Police, Roads, etc.  
(£351 million)

1'4

## OTHER SERVICES AND SURPLUS 4s.

General Services:  
Miscellaneous, including  
Commonwealth and Foreign,  
Tax Collection, Broadcasting,  
Employment Exchanges  
(£713 million)

2'8

Surplus: helps to finance  
capital expenditure  
(£364 million)

1'4

£1.0.0 Total £5,439 million

See explanation on opposite page.

## A FAVORABLE CLIMATE FOR STERLING

As has just been noted the outlook for Britain has changed radically—for the better—since the middle of 1958. The steady improvement of the external position (reserves over \$3 billion: exports earnings, down 3 per cent or so but imports prices down  $7\frac{1}{2}$  per cent in 1958) has led not only to the unifying of the sterling rates—the term to describe the major move to sterling convertibility taken as 1959 opened—but to relaxation of exchange control restrictions on dollar trade and payments (virtually all raw materials, foodstuffs, machinery and capital equipment generally can now be imported). At home there has been remarkable price stability and wage and salary claims have been relatively restrained. Freedom has been restored to the banking system and therewith to the individual and the businessman who for so long has been unable to buy his needs on credit—whether houses, refrigerators, new plants or machine tools.

The Government's own budgetary position was sound as 1959 opened, and as one of the Bank Chairmen pointed out in his annual statement, the Government has been able to carry out sufficient funding to provide for its budgetary deficit and its maturing bonds—thereby reducing the need for short term financing of government expenditure through the issue of new Treasury bills and retaining control over the short term money market.

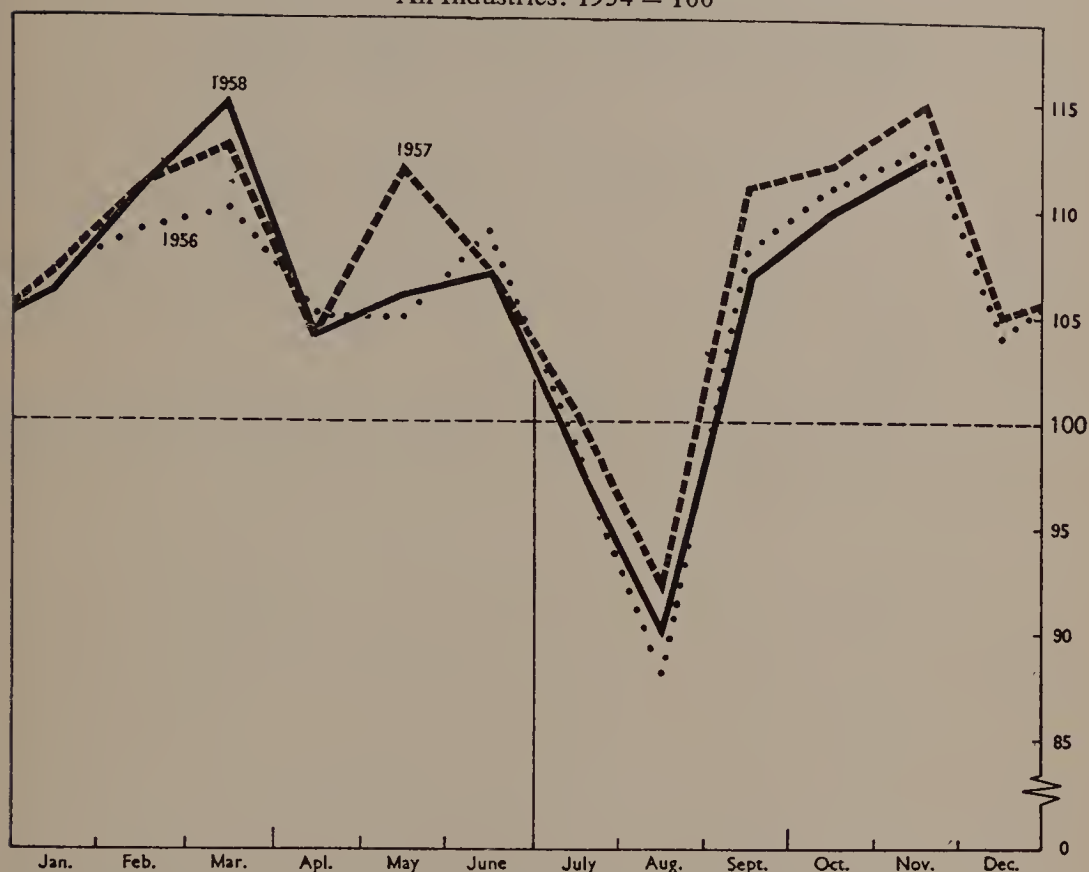
## THE DOMESTIC PROSPECT

But these developments—all most helpful in strengthening the pound sterling—are seen against a background of lagging production, the under-employment of Britain's greatly expanded capital resources and a perceptible rise in the unemployment of manpower—although unemployment is still under 3% of the employable labor force. While many still urge that a weather eye has to be kept open for the recurrence of inflationary pressures, the main question asked in 1959 seems so far to be, is the Government moving fast enough to restimulate the economy—following the period of forced restraint?

Most economists agree that part of the trouble is the world wide phenomena of poor export markets in 1958. For the rest, opinions vary. The banks and the business world seem generally to agree that the Government have adopted the right policy of "cautious reflation." They recognize that caution is still called for—that it was the Government's demonstration of its ability to control inflation that was perhaps the major factor (apart from the more measurable one of commodity prices) in sterling's big "comeback" last year. The critics are however more

# INDEX OF INDUSTRIAL PRODUCTION

All Industries: 1954 = 100



impressed by the lag in employment and production which appear to them to be the price of the Government's stabilization measures.

But the latest data shows that behind the production lag (of the order of 1 per cent per quarter in the first three quarters of 1958) there were divergent trends. In about one third of industry, output was actually up in the first half of 1958 over 1957. It was about steady in chemicals, engineering and electrical goods—accounting for about one fifth of industry. The falls were in steel (where a running down of stocks has been apparent), coal, furniture, clothing and textiles (the most serious case). It is also clear that the new freedom of borrowing was exerting a direct stimulus to consumer buying at the end of the year and that while private investment may continue to lag following its recent expansion the plans announced for public investment should at least prevent a falling off in the total of investment in 1959.

Certainly, with the enormous expansion of plant and machinery in the past few years, Britain can again—and at last—afford a substantial expansion of both her production and consumption.

# Britain and the Jet Age

by

Air Commodore Sir Frank Whittle

On April 12th, 1937 the first turbo-jet engine in the world made its debut in the turbine factory of the British Thomson-Houston Company, Rugby, England.

I stress 'first in the world' because many people still believe that we were beaten to it by Germany, whereas in fact, though von Ohain, working within the Heinkel organisation was close behind, his engine first ran in September, 1937.

In retrospect, our first engine known as 'W.U.' (= Whittle Unit) was remarkable for many reasons apart from the fact that it *was* the first. It made its first run almost within a year of the start of design drawings; it was built for a cost of about £3,000; it started up on the first attempt (and accelerated out of control up to half full speed). After its second reconstruction in 1938 it was the basic prototype of a large family of British and American jet engines; it survived nearly four years of development running before being wrecked beyond repair, and during that period was used to break the back of 90% of the development problems of the type. Also it was designed as a test bench version of a flight engine intended to make possible a Trans-Atlantic mail plane capable of cruising at 500 m.p.h. As everyone now knows, the brilliant achievements of the de Havilland Comet IV have proved that we were not wild visionaries in setting this target.

## ORIGIN OF THE "PROP JET"

But Britain's lead in the jet engine and turbo-prop field is by no means entirely due to the Whittle series of engines and their near relatives. Some two or three years before I applied for my first patent in January 1930, a scientist working at the Air Ministry's South Kensington Laboratory, and later at the Royal Aircraft Establishment, Farnborough—Dr. A. A. Griffith—had convinced himself (and at that time, only himself) that a propeller gas turbine was both feasible and desirable.

In this he was later joined by a staunch supporter in Hayne Constant. But though Griffith and Constant were allowed to make a few experiments with axial flow type compressors, it was not until our first engine



provided the stimulus that the Air Ministry began to take their ideas seriously and authorise the design and construction of the engine known as the F.2. This engine was built by Metropolitan Vickers at Manchester. It started its life in the design stage as a propeller gas turbine but in the light of the progress we were making with our simple jet engine, it was decided to redesign the F.2. as a jet engine. Though, for many years policy decisions and complexities of design and construction retarded the progress of the axial flow type of engine, nevertheless, the F.2. without doubt, shares, with the W.U., the parentage of most modern jet engines and turbo-props.

The foregoing is but a very bare outline of events which have led to a revolution in aircraft performance. The gas turbine has almost ousted the piston engine in all except light aircraft. Bomber Command and Fighter Command of the Royal Air Force (and the corresponding arms of most foreign air forces) are entirely jet propelled. Transport Command with its Comet IIs is largely jet propelled and, with the acquisition of Bristol Britannias, will become mainly gas turbine engined.

In the realm of civil aviation, the gas turbine is sweeping the field and has enabled Britain to make big inroads into what was once almost an exclusive American sphere. The Vickers Viscount powered by Rolls Royce Dart turbo-prop engines has been in service for several years now and hundreds have been sold to foreign airlines. It is becoming as dominant in the medium range field as was the wonderful Douglas D.C.3. in the past. In the class of long range turbo-prop aircraft, the Bristol Britannia remains unrivalled (though its supremacy in this sphere may soon be challenged by the Vickers Vanguard).

But in my opinion the highlight of modern civil aviation is the Comet IV which has risen gloriously from the ashes of the Comet I. To me the Comet has special significance—it has more than fulfilled our original targets.

#### THE SUPERSONIC LOOK

Many of these things have taken longer to come about than I expected. Much of what has been done could, I think, have been done years ago, but on the other hand, performance has far surpassed anything I would have dared foretell in 1937. Before the advent of the jet engine, the increase in the World Speed Record averaged 12 m.p.h. per year, but since the Gloster Meteor IV established a record of 606 m.p.h. in 1945, the increase has averaged over 60 m.p.h. per year. Since the end of the war the power of jet engines has been doubled and re-doubled. In spite of this progress there is still much more to come, and I for one, would

not dare to predict an upper limit to speed in the air. However, for the next decade or so I think that the cruising speeds of civil aircraft will be stabilised in the 400-500 m.p.h range for turbo-props and in the 500-650 m.p.h range for pure jet aircraft. But the supersonic airliner is inevitable sooner or later, and in my view, the immediate cruising speed target should be about 1,500 m.p.h. At this speed the jet engine operates with very high efficiency, while aerodynamic heating problems should not be too difficult. How soon this target will be achieved depends more on the skill of aircraft designers than on engine development, though the latter will, of course, play its part.

To me, one of the most satisfying aspects of Britain's prominent role in the jet age is the astonishing rise in the exports of the aircraft industry—now running at the rate of about £150 million a year. Britain must import about half her food and a high proportion of her raw material needs, and these imports can only be paid for by exports, so it can truly be claimed that the aircraft gas turbine is helping to feed the nation. For this reason alone, it is important that Britain should maintain its position in the van of progress.

## The Decca Navigator System

The latest form of airborne Decca Navigator equipment enables a pilot to see exactly where he is and where he is going.

The Ministry of Transport and Civil Aviation, which regulates air traffic over Britain, has stated that the Decca Navigator is the only navigation system which is accurate and flexible enough to keep the rapidly growing air traffic moving smoothly and quickly along Britain's airways and in control areas.

The outstanding features of the Decca Navigator system are:

- (1) the precision and ease with which planes can fly along airways, climb, descend and "hold" their positions in a stack.
- (2) the precision and ease with which the pilot can report an aircraft's position.
- (3) with this system it is possible to lay down new air routes with great ease to meet changing circumstances and thus make full use of the available airspace.

Already 5,000 ships and aircraft—including British European Airways' "Viscount" fleet—use the Decca Navigator, and 13 chains of transmitters are working full time in Europe and North America. BOAC plans to use it in its transatlantic jet aircraft.

*In 1958 Britain's exports were below the peak level of 1957, but still higher than in any previous year. The bill for imports was down mainly because of price falls.*

## Britain's Overseas Trade

A decline in the level of overseas trade was already under way at the beginning of 1958. For imports the fall had started in the middle of the previous year when commodity prices and freight charges dropped back from the temporary peak of the Suez period and continued to decline as world industrial activity slackened and some surplus of commodity supplies emerged. The general fall in prices came to a halt in the Spring of 1958, and from that point imports ran fairly level, but at well below the 1957 average rate. For exports the downturn had come rather later, in the last quarter of 1957, and in the early part of 1958 the decline compared with 1957 was only very small. Later it deepened, but in the final months of the year the trend was considerably improved. The final result for the year was that both imports and exports showed a fall after four successive years of increase, but in both cases a good deal smaller than at one time appeared likely. Since the fall in imports was ahead in point of time and of greater size than that for exports, the visible trade deficit in 1958 was very considerably reduced; most of the improvement came in the first half of the year, but even the rather higher rate of deficit in the second half was below the average for any of the seven preceding years.

### WORLD ECONOMIC CONDITIONS

Domestic exports in 1958 were £3,208 million, 3½ per cent less than in 1957 but higher than in any previous year. Export prices were on average only fractionally lower than in 1957. The index for manufactured goods (over 80 per cent of all exports) has been virtually unchanged for the last eighteen months; textile prices have been falling since mid-1958 but prices of engineering products have continued to rise slowly. However, there have been fairly sharp reductions for some less-highly processed exports, reflecting the lower cost of their constituent materials. The volume of shipments was just over 3 per cent lower in 1958.



### I. UK OVERSEAS TRADE: SUMMARY (£ million)

	1938	1956	1957	1958
Imports (cif) .....	920	3,886	4,071	3,780
Exports (fob) .....	471	3,172	3,324	3,208
Re-exports (fob) .....	62	146	134	148
Visible Deficit .....	387	568	613	424

### II. VOLUME OF UK OVERSEAS TRADE (1954 = 100)

	1938	1956	1957	1958
Total Imports .....	111.0*	110.5	114.6	114*
UK Exports .....	60.0*	113.5	115.7	112*

\*approximate

### III. UK TRADE BY AREA IN 1958 (Percentages)

	UK Imports	Total UK Exports
Sterling Area .....	37.9%	44.1%
Western Europe .....	25.5%	26.1%
U.S.A. ....	9.3%	8.7%
Canada .....	8.2%	5.8%
Soviet Union .....	1.6%	1.5%
China .....	0.5%	0.8%
Rest of World .....	17.0%	13.0%

### IV. UK TRADE WITH USA (US \$ million)

	1950	1956*	1957*	1958
UK Imports (cif) .....	592	1,142	1,352	985
UK Exports (fob) .....	316	680	683	763
UK Re-Exports (fob) .....	40	44	41	58
Apparent deficit .....	236	418	628	164

\*exports include the repayment of silver bullion, 1956-57.

World economic conditions were distinctly less favorable for United Kingdom exports in 1958. The earlier rapid expansion of activity in Western Europe slowed down, turning to actual recession in some countries. There was a very sharp recession in the United States, although a recovery beginning just before the middle of the year, has in turn also made rapid progress. The export earnings of many primary producing countries were reduced by the fall in commodity prices and, to a smaller extent, by a lower volume of demand. Drawing-down of reserves and increased receipts of capital enabled the first impact of the loss of earnings to be absorbed without much effect on imports, but a number of countries were forced to impose restrictions or internal restraints.

All these developments were reflected in the course of United Kingdom

V. MAIN UK EXPORTS TO USA IN 1958 (FOB)  
(In \$ million)

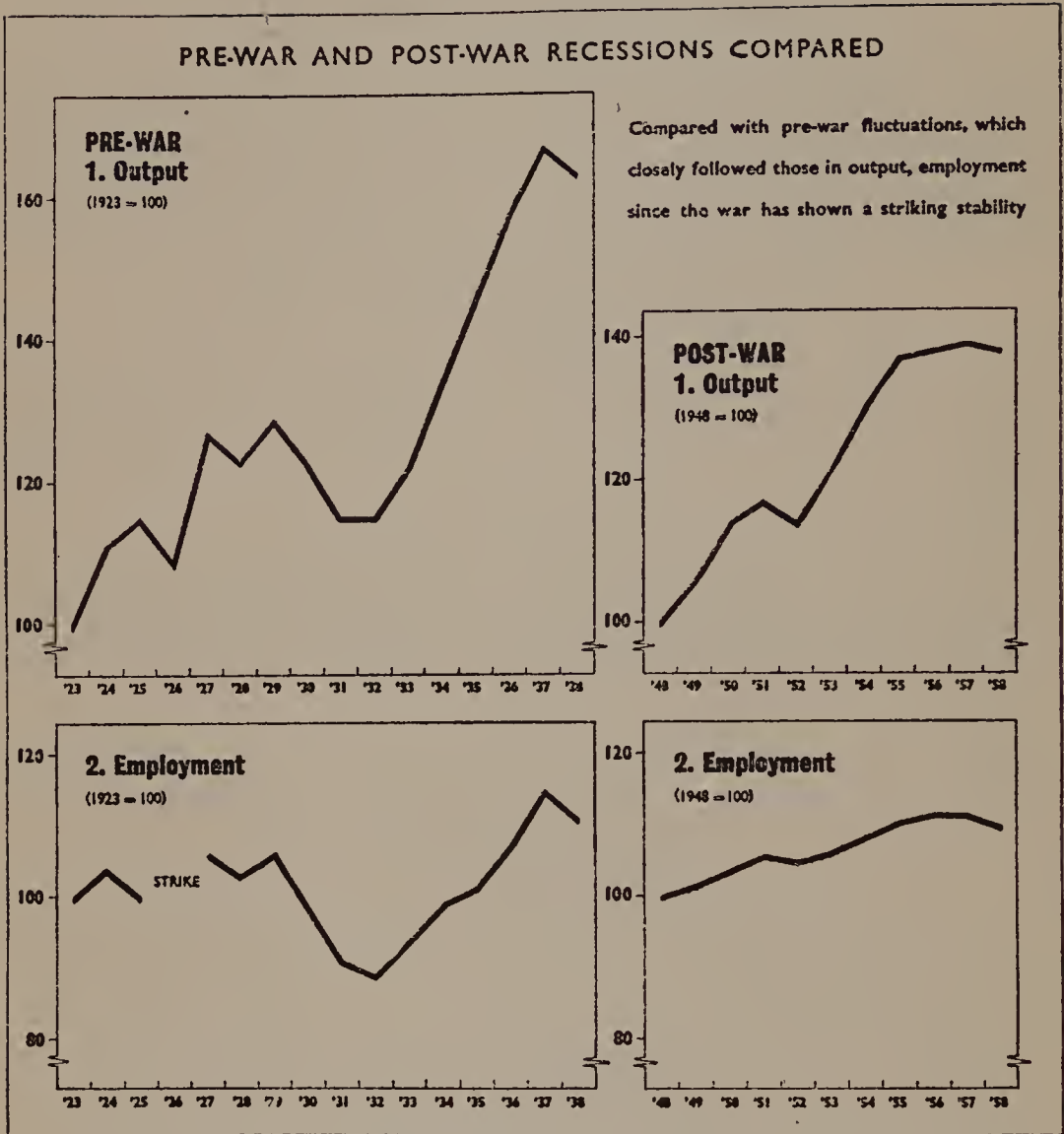
Road vehicles and aircraft .....	237
Whisky .....	88
Machinery (non-electric) .....	71
Non-ferrous base metals .....	45
Miscellaneous manufactures .....	40
Woolen goods .....	26
Machinery (electrical) .....	24
Clothing, footwear, travel goods .....	22

VI. MAIN UK IMPORTS FROM USA IN 1958 (CIF)  
(In \$ million)

Cereals .....	155
Tobacco .....	132
Machinery (non-electric) .....	108
Cotton .....	85
Chemicals .....	76
Non-ferrous base metals .....	75
Petroleum .....	52
Fruits and vegetables .....	27

*Note:* *cif* means cost, insurance and freight: that is the cost of the goods including transit, etc. *Fob* means free on board, that is the cost of the goods delivered on board ship and excluding transit costs. Insurance and freight usually add some 12½ per cent to *fob* figures. To establish the true trade balance, trade figures are taken *fob* for both imports and exports, as in the balance of payments figures.

exports during the year. In the early months there was a fairly heavy fall in exports to Western Europe which in 1957 (particularly in the first half year) had been Britain's most rapidly growing market, and the rise in exports to North America slowed down (though because of car sales it did not completely stop). Shipments to the primary producing countries, particularly in the sterling area, however, continued to rise. The net effect was that in the first five months of the year exports were only 2 per cent below the corresponding period of 1957. Over the next four months (a period when the individual monthly figures were considerably affected by the delay and subsequent recovery arising from the London dock strike) although exports to the USA remained buoyant and the downward trend in sales to Europe moderated, a reduction in purchases by a number of primary producing countries began to be felt. In total, exports were 6 per cent below a year earlier. In the final quarter, exports to Western Europe did not change much and were still appreciably below the 1957 level. There was a rapid acceleration in shipments to the USA (they were nearly one-third higher than a year earlier, with the increase spread over a fairly wide range of goods instead of being concentrated, as earlier, on cars). The decline in exports to primary producing countries was also checked. The improvement brought the value of exports in the last quarter to only 1½ per cent below the last quarter 1957.



It is too soon to be certain that the recent level of exports to primary producing countries can be maintained, now that commodity prices are more stable and some re-expansion in the volume of commodity trade is probably beginning, or whether some further fall is yet to come.

**LOWER PRICES FOR IMPORTS**

Imports totalled £3,780 million in 1958, £291 million or 7 per cent less than in 1957 and about £100 million less than the totals for both 1955 and 1956. The fall was wholly accounted for by lower prices; the volume of arrivals was practically unchanged, running very slightly

below the 1957 level over the first three-quarters of the year but rising in the final months.

Widespread falls in commodity prices and in freight charges brought the import price index down by 12 per cent between April 1957 and March 1958, and although its course since then has been level the average for the year was  $7\frac{1}{2}$  per cent below 1957. Food import prices, which shared fully in the fall up to March 1958, have since risen by over 5 per cent, thus regaining to the pre-Suez level of 1956. But despite some recovery from their lowest points in the prices of copper, lead, zinc, rubber, and, more recently, tin, the overall level of import prices for industrial materials has continued to fall. The major decline in wool prices has been the biggest factor, but aluminum, timber, woodpulp, and cotton have also fallen during 1958. By the end of the year import prices in this sector were about 15 per cent below the level of early 1957 and some 10 per cent below mid-1956. Oil import prices fell by over 20 per cent between early 1957 and early 1958, but have since been fairly steady, at a little above the pre-Suez level.

The reduction in the rate of stockbuilding both within and beyond the industrial sector, which along with the fall in exports was mainly responsible for the lower level of industrial activity in 1958, had a cumulative effect on output in the primary stages of industry and therefore on consumption and imports of materials. Marginal imports, notably of steel, were severely cut down. The heaviest decline in output was in the textile industry which has a relatively high import content. Stocks of imported materials themselves were reduced during 1958 (compared with a building-up in 1957). All these factors combined to produce a considerable and widespread fall in the volume of imports of materials. By the end of the year, however, there were signs of revival in the consumption and imports of a number of commodities.

In other sectors the volume of imports was higher in 1958. Food imports were particularly heavy in the second half of the year. Since the restoration of normal supplies in mid-1957, petroleum imports have maintained a very strong upward trend, and for the year were about 15 per cent higher than in 1957. The rise in imports of finished manufactures, a prominent feature now for several years, also continued in 1958.

#### VISIBLE TRADE DEFICIT

With imports down in 1958 by £291 million, exports by £116 million, and re-exports £14 million higher, the visible trade deficit was reduced by £189 million to £424 million. Apart from 1950 this was



the lowest since the war. Most of the improvement compared with 1957 came in the first half of the year (in fact £170 million of it). In the second half, when import prices had stopped falling and the volume of arrivals showed some increase, while the decline in exports for a time steepened, the average deficit was £13 million a month higher, and only a little below the second half of 1957. Thus it is certain that the exceptionally large payments surplus on visible trade in the first half of 1958 will not be repeated in the second half, and there is likely to be a return to the position of a small deficit as in 1956 and 1957.

(Trade Accounts figures differ from those for visible trade in the balance of payments where imports are entered fob, and insurance and freight, in so far as they are paid abroad, are included in invisible expenditure. There are also significant differences in timing and coverage between the two sets of figures.)

## Convertibility Moves

Since December 29, 1958, the sterling earnings of non-residents of the sterling area have been freely transferable throughout the world. As a consequence, such non-resident sterling is convertible into dollars or other currencies at the official rates of exchange.

For some time past, since 1955, Britain has prepared the way for this move by permitting something very similar to the new "non-resident" convertibility: since 1954 sterling held or acquired by non-residents has been handled under two main types of account only—"American Account" sterling, which could always be exchanged into dollars at the official rate of \$2.80 to the pound; and "Transferable Account" sterling available to all the countries outside the dollar area or the sterling area, i.e. all other countries in the world. Hitherto transferable sterling could not be turned into dollars in London, although it could be moved freely in the transferable account area and used for payments into the sterling area. But since 1955 it has in effect been convertible into dollars at a very slight discount—through transferable account markets set up abroad.

The latest move, effective December 29, 1958, was in effect the merger of the American accounts and the transferable accounts—which will now be convertible in London at the prevailing rate of exchange.

It does *not* mean that Britons are automatically free to spend all they want in dollars. Sterling area residents are still subject to their local exchange controls (although major relaxations have been made in dollar import controls). Also, it does *not* cover capital movements. Here too the former exchange controls operate.

# British Nuclear Power Developments

by

SIR JOHN COCKCROFT

The progress towards the large scale development of nuclear power has been one of the most remarkable achievements of the post-war era.

The key to nuclear power was found in the late 1930's through the discovery by Hahn and Strassman of the fission of uranium. They found that the elementary particles, neutrons, discovered by Chadwick in Cambridge in 1932, could cause the heavy nuclei of uranium to split up into two high speed fragments. These fragments were found by other workers to throw out neutrons, and these could obviously be used to produce more fissions, so a chain reaction was seen to be possible in principle. The energy released in the fission process was found to be very high, the energy released by the fission of one gram of uranium being equal to that released in the combustion of three tons of coal.

## FIRST ATOMIC PILE

The war years brought this to practical realization with the construction of the first atomic pile by Fermi and his colleagues in America, in 1942. The Fermi pile consisted of a pile of blocks of pure graphite interspersed with bars of uranium metal and uranium oxide. The uranium nuclei split up spontaneously at a low rate and throw out neutrons. These cause further fissions and these produce more neutrons. If the birthrate of neutrons exceeds their deathrate the chain reaction builds up—it is said to be divergent. But it can be brought into a steady state by inserting control rods containing boron or cadmium which swallow up neutrons so that the birthrate and deathrate can both be made equal. The function of the graphite moderator is to slow down the neutrons emitted in fission from their initial high speed to lower speeds where they are more efficient in producing further fissions, but they do that only in the light isotope of uranium U.235—present in part in 140 of the whole.

From Fermi's simple graphite pile to the first large scale nuclear power station at Calder Hall took fourteen years to achieve.

## GRAPHITE PILE IN BRITAIN

In Britain we decided to adopt the graphite pile as our route to nuclear power for a variety of practical reasons. When we formed our atomic energy team in Britain we found it easiest to build graphite moderated reactors because we could produce all the special materials ourselves or in the Commonwealth. Our first two reactors at Harwell—GLEEP and BEPO—were of this type, and they were followed by two much larger reactors at Windscale (Cumberland) designed to produce plutonium for military purposes.

Our first use of nuclear energy was to heat some of our Harwell buildings—to produce “atomic hot water.” The energy contained in the flying projectiles of fission of uranium heats up the uranium metal bars of the pile, and this heat is removed in BEPO by flowing air past them. The hot air passes over a heat exchanger, and so we get our atomic hot water.

## CALDER HALL

The Calder Hall nuclear power station uses the same basic principle. The two nuclear reactors of the power station are contained in steel pressure drums 37 ft. in diameter. Each reactor contains 1,200 tons of graphite blocks and 130 tons of uranium metal sheathed in a magnesium alloy. The energy of fission raises the temperature of the uranium fuel elements to a maximum of 408°C. The heat is transferred to four heat exchangers by circulating CO<sub>2</sub> gas under a pressure of 7 atmospheres. Water in the heat exchanger is heated and steam is raised and then passes to a conventional power station where gross output of 90 MW of electricity is generated.

The Calder Hall power station was built primarily as a plutonium producer with electricity as a by-product. We have had 2½ years of operating experience and this has on the whole been very satisfactory. Up to the present Calder Hall has generated over 1,000,000,000 units of electricity. One of the two reactors operated continuously for six months—an indication of its reliability.

## UK PROGRAM

The success of Calder Hall led to a program of construction of nuclear power stations by the Electricity Boards. The Government's object in developing nuclear power was to provide an additional source of energy to meet our rapidly increasing needs. Economic forecasts showed that our energy requirements would increase by 50% between 1955 and 1975—from the equivalent of 240,000,000 tons of coal to 360,000,000



tons. Coal production had been about 220,000,000 tons, and in spite of a large capital investment program is not now forecast to grow beyond this level; so the energy gap will have to be filled by increasing coal or oil imports and by nuclear energy. The Suez episode emphasized the danger of relying too heavily on imported oil, and the nuclear power program of 5000-6000 MW by 1966 was decided on. By 1962 the Electricity Boards will have built nuclear power stations at Bradwell, Berkeley, Hunterston and Hinkley Point, developing a total of about 1400 MW. A further power station is planned in North Wales, and other stations at Dungeness in Kent and Sizewell in Suffolk are proposed. They are all located on the coast because, like all large power stations, they require a lot of cooling water and suitable river sites are now scarce. They are also located away from coal fields because coal-fuelled power stations located on the coal fields will satisfy nearby users, so it is obviously economic to site nuclear stations on distant sites where coal costs would be higher.

The Electricity Board power stations are typified by the Hinkley Point power station in Somerset, which is to develop 500 MW of electricity. It will have two reactors, each of them containing 570 tons of uranium metal fuel. The reactors are contained in large spheres 70 ft. in diameter, and carbon dioxide will be circulated as a coolant. A later power station will develop 650 MW. The comparative economics of the Hinkley Point power station and a coal-fired station on a similar site show that in spite of much higher capital costs, nuclear power just about breaks even with conventional power. This is because fuel costs are expected to be much lower than coal or oil fuel costs; in fact the magnitude of capital charges and fuel costs are reversed in the two cases.

#### ENRICHED URANIUM EXPENSIVE

We have not so far developed nuclear power stations of the pressurized water or boiling water type because they use enriched uranium, which costs about twice as much to produce in our country as in the US, and our production of enriched uranium is much less. They would not be economic in our country using UK enriched fuel, in spite of the fact that capital costs are almost 20% lower than those of the graphite moderated gas cooled reactor type.

This situation may change in the future as our large scale nuclear power program comes into being, for our natural uranium-fuelled power stations will produce large amounts of plutonium as a by-product. This is a valuable nuclear fuel which may be used to provide enrichment by adding it to natural uranium, and so increasing the proportion of the fuel which is fissioned by slow neutrons.



## TO REDUCE CAPITAL COSTS

The next phase in the development of nuclear power stations aims at achieving a major reduction in capital costs while retaining fuel costs at their present low levels.

In order to do this we aim at increasing the temperature of operation of the fuel elements from 430°C to about 600°C. This will enable the steam pressure and temperature to be raised so that the cost of the conventional part of the power station can be reduced appreciably. In the 1960-67 power stations this part of the power station costs as much as the whole cost of a conventional power station. We will also increase the amount of heat we can extract from each ton of uranium about three times. To do this we will split up the fuel elements into a cluster of small diameter rods. The fuel elements will have to be uranium oxide because metal would be too soft at the higher temperatures. We will also have to abandon our magnox sheaths and use beryllium metal—if we can develop its technology soon enough. Failing this, we would have to use stainless steel.

By this means we hope to reduce capital costs by about 20% below the best of the 1960-65 stations.

## FAST BREEDER REACTORS

Another type of reactor favored for our longer term program is the so called “fast breeder reactor.” The fast reactor of the future will probably consist of a small core of plutonium oxide interspersed with some uranium. The core will be surrounded by a so called “blanket” of natural uranium or depleted uranium. The chain reaction proceeds in the core, and the neutrons are slowed down only by collisions in the uranium or plutonium. They produce further fissions while they are moving *fast*. The overall result of this is that in a plutonium-fuelled fast reactor, for each primary plutonium atom destroyed, about 1.5 new ones will be produced by capture of the neutrons in U.238. So the reactor is said to *breed*—it breeds plutonium from the abundant heavy uranium.

The long term advantage of the fast reactor is that it will enable us to make use of a large part of the fissionable energy of U.238, whereas the earlier so-called thermal reactors rely mainly on the fission of U.235 which is less than one per cent of the total uranium.

So to make the fullest use of the energy in uranium we will have to develop breeders.

## PLUTONIUM NEEDS

The time scale for fast breeder reactor development, however, is set by the availability of the large amounts of plutonium for the initial

charge of the core. A future fast reactor power station may require as much as half a ton of plutonium for a charge. On the other hand, when we have 5000 MW of nuclear power stations installed, they will be producing by 1970 about 4 tons a year of plutonium. So we can envisage a program of construction of large scale fast reactor stations starting in the 1970's.

We have made a start by building a fast reactor experiment at Dounreay. We expect that this reactor will go into commission later this year, and we will then be able to obtain operating and technological experience before going on to design a prototype of a future fast reactor power station.

Nuclear fission could ensure the world's energy reserves for many centuries. Beyond that or before that we have the alluring prospect of drawing energy from the fusing together of light nuclei. The sun and stars have been using this source of energy for several billion years, and it is a tremendous challenge to science to harness the energy of fusion of light nuclei. We are playing a leading part in research on this fascinating project.

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## Nuclear Information Center

An Information Center has been opened by the United Kingdom Atomic Energy Authority at its London headquarters, 11 Charles II Street, S.W.1.

Its purpose is to provide a central spot where published unclassified material may be consulted with no security restrictions. Advice on sources of information is also given.

A collection of UKAEA Unclassified Reports, indices and abstracts of atomic energy literature, and publications on the work of the AEA, are all on file.

Adjoining the Center is an 8,00-print Photographic Library. Prints may be bought from stock or ordered to suit particular requirements. Slides in color and black-and-white may be borrowed.

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*In postwar years Britain has developed a new industry on the old lines of importing raw material and exporting finished products. Britain paid more than £433 mn. for her oil (mainly crude) imports in 1958. Her exports of refined oil products, however, came to over £100 million.\**

## What Oil Means to Britain

The importance of abundant oil supplies to an industrial nation such as Britain is clearly apparent. Millions of cars, trucks and other vehicles, carrying passengers and goods along her roads, are powered by gasoline or diesel oil. Every aeroplane and the vast majority of her merchant ships also use fuels derived from petroleum. Britain's food is produced by the help of oil-powered tractors and machinery, which have been a most important factor in the remarkable increase in food production achieved by her farmers over the past dozen years. Her steel industry, her potteries, glass and ceramics manufacturers, all use oil fuel, which—among other advantages—enables them to obtain that precise control of heat which is particularly necessary in these processes. The gas and electricity industries are likewise using oil power, to supplement coal resources, and many other industries are similarly turning, in whole or in part, to oil fuel. But this is only part of the story. For petroleum is also the source of virtually all lubricants, and without these not only the motor car and the aeroplane, the ship and the tractor, but also the steam engine, the electric train and the coal-fired vessel would be completely motionless. Indeed, without oil to lubricate its machines, hardly a single industry—no matter how small—could survive, and industrial Britain would cease to exist.

Fuel and lubricants, most obvious of the uses of oil, are only two among a multitude of needs fulfilled by petroleum. There are literally hundreds of petroleum derivatives which are used by industrial firms in processing or manufacturing products as diverse as insecticides, synthetic detergents and fibers, plastics, rubber goods, paint and artificial silks.

While the cost of petroleum products to Britain and the rest of the sterling area involves Britain in a net outlay of dollars, the position has

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been much improved in the past decade. This is mainly due to the increase in production of crude oil from Middle East sources, and to the development of refinery capacity in Britain. It is also due to the earnings of British companies from the sales of refined products in overseas markets, and to the increased refinery capacity throughout the sterling area and Western Europe. The new refineries in Britain, operating on imported crude oil, not only now enable us to meet our domestic needs at a comparatively low expenditure of dollars, but have even made available a surplus of some products for export. Another important contribution to Britain's improving position comes from the steady development of the manufacture of oil equipment in Britain as a result of which the oil industry can obtain for sterling an increasing amount of equipment for use in Britain and overseas which, until recently, had to be paid for in dollars.

#### OVERSEAS PRODUCTION AND REFINING

Although the USA still remains the world's leading oil producer, British interests in the international oil industry are very considerable, and, after US companies, British and associated Dutch groups are the leading oil producers. By the middle of last century the industrial revolution had given rise to a growing demand for oil products for lighting and lubrication and the development of the US oil industry in the 1860's showed that crude oil could be recovered in large quantities by drilling. Following this, British citizens pioneered in developing the oil resources of many lands in the latter half of the 19th century. Thus, British companies were producing and marketing oil on a world-wide scale before the advent of the motor car, the aeroplane and other oil-propelled transport had given a new impetus to the oil industry. The large capital requirements which, even in the early days, were essential for oil operations, were readily available to Britain who, at that time, had a very favorable trade balance, based on the exports of coal and manufactured goods, supplemented by "invisible earnings" from overseas trade, banking, shipping, insurance and other services.

British companies thus acquired a very substantial share of the world's oil industry, and this has been steadily developed by continued investment up to the present time. As a result, British companies, sometimes associated with Dutch interests, produce in a score of different countries—including the USA—about 130 million metric tons of crude oil a year. The importance of their total oil production to world trade is, perhaps, even better appreciated when it is noted that they are responsible for producing approximately a third of all oil entering into international



trade (which excludes oil produced and consumed in the USA and USSR).

British companies (including the associated Dutch interests) are concerned in oil production in all the main producing areas other than the USSR. In the Middle East—which is estimated to contain a greater volume of proved oil reserves than any other region—they have a share of just over 50 per cent in Persian oil production, and are also responsible for more than 30 per cent of all oil produced elsewhere in the Middle East. In the Caribbean area, which includes Venezuela—the world's second largest producer and chief exporting country—British companies produce about 35 per cent of the total output, while in the Far East they account for some 50 per cent of all oil produced.

Their interests in the marketing side are even more widespread, for in recent years, as a result of production and purchases, they have handled up to 50 per cent of the world's oil trade (excluding the USA and USSR controlled territory) and pending a further extension of their production facilities they have even found it necessary to buy crude or refined oil from U.S. companies in order to meet all their marketing commitments. They have also very substantial refining capacity, for at the end of 1957 they operated plants with a total crude oil capacity of some 150 million tons per annum, with additional capacity under construction. To provide for the world-wide transportation of crude oil and refined products Britain owns the second largest tanker fleet in the world. The British fleet, with a combined carrying capacity of over 8 million tons, accounts for over 16 per cent of total world tanker tonnage (vessels of 2,000 d.w. tons and over).

#### BRITAIN'S NEW REFINING INDUSTRY

Post-war industrial development in Britain has seen the creation of a major refining industry. Between 1947 and 1957 refining capacity in the UK was raised from 2,500,000 tons a year to over 30,000,000 tons a year. And in initiating, financing and carrying out this program, the oil industry has placed Britain on a level with France as one of the two most important refining countries in Western Europe.

Refineries like those situated at Fawley, Grangemouth, Llandarcy, Shell Haven, Stanlow and the Kent refinery on the Isle of Grain, rank among the major industrial undertakings of post-war Britain. The smallest of these vast new refining plants is alone capable of refining nearly as much oil as the entire British refining industry in 1947, and the largest can process 10,500,000 tons of crude oil annually.

The development of the new refineries in Britain which by now has

involved the oil industry in a total cost estimated at over £250 million has had an important effect in reducing Britain's expenditure of foreign currency, since the cost of the imported crude oil is substantially less than the cost of importing the refined products obtained from a given quantity of crude. Thus, the oil industry in Britain has made a substantial contribution towards Britain's efforts to secure a favorable trade balance. The benefit derived from the export of refined products is indicated by the fact that the annual value of these exports totals something approaching £100 million.

A further advantage of Britain's enhanced refining capacity is the production from petroleum of the raw materials for the manufacture of organic chemicals, which form the basis of many new products. An indication of the ramifications of these petroleum-chemicals can be gathered from the example of acetone, which is used in the manufacture of aeroplane dopes, paint removers, leathercloth, photographic film, celluloid, acetate rayon and transparent paper. It is also used for the extraction of many drugs and pharmaceutical products, and as a raw material in the making of chloroform and of synthetic perfumes and plastics. The availability within the U.K. of this new source of organic chemicals is obviously of great advantage to British industry generally.

Another important economic benefit has resulted from the building of sulphur recovery plants at some refineries. The sulphur obtained in this way is of exceptionally high quality, and is supplied to other industrial undertakings—thus providing valuable supplies of a commodity which is mainly obtained from dollar sources.

A point of interest in connection with oil refineries and the chemical plants based upon them is their high capital cost in relation to the manpower employed. And this applies, in fact, to all aspects of the oil industry. For example, one major company in Britain has estimated that its capital investment, necessary to provide for its UK commitments, is equivalent to approximately £10,000 for each of its employees—a figure far higher than that applying to other industries.

#### TANKER CONSTRUCTION AND EQUIPMENT MANUFACTURE

Britain's interest in the petroleum industry is by no means limited to the production and refining of crude oil and the sale of refinery products. The oil industry has, in fact, been of considerable importance to British industry generally, notably shipbuilding and engineering and, through these industries, to steel and coal. At mid 1958 more than 50 per cent of all tonnage under construction in Britain's shipyards was represented by oil tankers while orders for oil industry equipment placed with British

manufacturers have averaged over £100 million p.a. in recent years, and in 1956 amounted to over £150 million. These orders covered not only the specialized drilling, refining and pipeline equipment formerly obtained in pre-war days mainly from the USA, but included a variety of miscellaneous goods ranging from office requisites to medical and sports equipment. The development of the British oil equipment industry—encouraged and helped by the oil companies—has resulted in a substantial saving on foreign exchange account. To the extent that equipment has been ordered by overseas buyers there has also been a welcome contribution towards a favorable balance of trade. A similar effect has been achieved by the overseas orders for British-built tankers. In this connection it is interesting to note that tankers and equipment, representing a considerable expenditure, have been ordered in Britain by USA controlled companies operating in the British Isles.

#### THE FOREIGN EXCHANGE POSITION

While the overseas activities of British oil companies inevitably involve an appreciable outlay of foreign currency there must be offset against this the important earnings of foreign exchange resulting from overseas sales. Moreover, the overseas production by British companies means that oil supplies for the UK and the sterling area as a whole can be supplied with a far lower expenditure of foreign exchange than would have been the case if Britain had not built up a substantial interest in the international oil industry. Thus, the overseas production and sales of oil by British companies, (and the associated Dutch interest) coupled with the tremendous expansion of refining capacity in the UK and the development of the British oil equipment industry, are all of considerable importance to Britain's economy. In the case of British companies overseas, production has increased from 66,000,000 in 1947 to about 130,000,000 tons in 1957, and new refineries constructed overseas which have come into service in recent years are Aden, and others near Fremantle, Melbourne, and at Bombay. The great expansion which has already taken place has inevitably involved the companies concerned in vast expenditure—a great proportion of which has been provided out of earnings. Some indication of cost can be gathered from an estimate, made some while ago, that a capital expenditure of about £40 is necessary for every ton by which the annual output of finished products is increased.

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## Book Reviews

**King George VI—His Life and Reign** by John W. Wheeler-Bennett (Macmillan, London, 1958, 891 pages, 60s.)

The significance of this very considerable work by an historian of the highest repute lies not only in the study of the King but in the fresh understanding it affords of monarchy. The televising of Queen Elizabeth's Coronation brought home to millions the deep religious symbolism of the crowned head. The reading of this book will no less surely bring to closer students a new understanding of the place of the monarchy in a democratic government. It lays bare the modern relation between the Monarch and his people, and shows how it may be that a man or a woman raised to this high eminence can remain a humble, kindly person. Clearly the institution of kingship is greater than any King; but one is left with a sense of wonder at the man or woman who fills this role.

This is an official life: but the restraint imposed on authorship of such a work does not prevent the human touch coming through. To begin with, there is the strong, even overwhelming "family" background and therewith the close supervision of the young prince—a very ordinary small boy—by his father George V. But Prince Albert as he was, was not groomed for the throne. His brother Edward was the heir. He went through the full training of a regular Naval Officer, entering the Royal Navy Cadet College at Osborne at the tender age of 13. Even after the first World War when he was taking his full share of the Royal Family's responsibilities in public life, the road did not lead to the throne. In this period the Prince came to turn his attention—most happily—to industrial and social problems. The part he played in bringing to the factory workers (at a time of considerable industrial unrest) and to industrial management a new sense of common responsibility lies at the root of the concept of a modern king, who sides with no faction or class in the running of the country. The account of his work in the founding of the Industrial Welfare Society and his own "Duke of York's Camp" an annual camp for schoolboys and industrial apprentices from all walks of life is one of the most absorbing parts of this book.

The abdication of his brother Edward and his own accession are seen largely through George VI's own letters at the time of this great drama. Then follows the tale of his devoted Kingship. It is a tale of the constant upholding of human values. The youth, raised in the somewhat insensitive traditions of the country gentleman, his father, but inheriting too his family's strong sense of public duty, had developed a deep understanding of the trend of the times which he interpreted with humanity and wisdom. During the war, his memoranda and his daily



diary (which is extensively quoted) show a clear grasp of the underlying threat of Naziism; a dislike of "deals" with Vichy; the importance to him of the American alliance in peace and war (the effect of his visit to the United States and his subsequent contact with President Roosevelt prove to have been of the deepest personal—and national—significance). At home he was no less quick to grasp the fundamentals of a changing age. His interest in social reform and post war reconstruction was continuous; his liberal and humane outlook on affairs enabled him to work with his successive governments with ease and enthusiasm. Above all, as his daughter Queen Elizabeth II has written:

"It was this unassuming humanity, this respect for the 'homespun dignity of man' which enabled my father to preserve in a changing world that affection and respect for the Crown by which our free Commonwealth of Nations is united."

£      £      £

**The Motor Industry** by G. Maxcy and A. Silberston (Allen & Unwin, London, 1959, 245 pages, 25s.)

The motor car industry in Britain, as in the United States, is one of the major props to the economy. Not only that, for Britain the industry is one of the chief earners of foreign exchange including sizeable amounts of dollars. Thus a book concentrating on the economics of the motor industry is particularly appropriate, especially at the present time when there are signs of changing patterns in demand, especially in the United States.

This book is comprehensive: it examines the short but startling history of the industry, considers its structure and the nature of the demand for its products, and then examines production methods, competition, profits and sources of funds, and prospects.

The authors conclude that further horizontal mergers should, in general, be welcomed. "They are unlikely to lead to monopoly, and should enable the technical optimum to be approached." On vertical integration, the authors are less sure, for the "balance of gains and losses is far less clear." The reference, of course, is to the British motor industry.

£      £      £

**The Boss** by Roy Lewis and Rosemary Stewart (Phoenix House, London, 1958, 255 pages, 21s.)

"The Life and Times of the British Business Man", the sub-title of this book, is an accurate description of the contents which range from "Under the Top Hat", "The Way to the Top", "Life at the Top", and "Living with the Business Man".

Although described as a "witty and living social history", the book is serious, well documented, and very readable. The business man, creator of jobs and wealth, has hardly ever been given a fair break. The muckrakers have long been at him, followed by the Public Relations Officer now enjoying a certain esteem and popularity. This book attempts successfully to put the businessman in his proper perspective.

£      £      £

**The Future of the Sterling System** by Paul Bareau (Institute of Economic Affairs, 1958, 85 pages, 5s.)

In recent years much light has been thrown on the workings of the sterling area. There have been pamphlets and great tomes. There have even been discussions on whether the sterling system had outlived its usefulness. Among the many contributors, Mr. Paul Bareau, Deputy Financial Editor of the *News Chronicle*, has figured prominently. Now he has come along with this booklet which gives a short account of the sterling area followed by a discussion of the sterling system and its importance both to Britain and the rest of the world.

The booklet came out too early to take account of the December announcement of the amalgamation of transferable account sterling with American account sterling (a course which Mr. Bareau recommends), but it is nonetheless a comprehensive if brief account of how the sterling area functions, and is really invaluable to the student of sterling.

Mr. Bareau examines convertibility, fixed and floating exchange rates, confiscation of foreign exchange, and exchange control. There is no doubt about the author's views on controls. His last sentence reads: "Thus exchange control deprives everyone of us of part of our freedom of choice. That freedom must be restored in a free society." Amen to that, most Britons would say.

Mr. Bareau preaches the gospel of thrift and restraint. It is to be hoped that he will not require the long suffering public in the sterling countries to practice these twin virtues in greater measure than hitherto, but, given them, Mr. Bareau believes that the sterling area will survive and thrive (as will Britain herself) and continue as a keystone in world trade and finance. A number of appendices and a short bibliography round off the discussion. There is an introduction by Sir Oliver Franks, Chairman of Lloyds Bank and one time British Ambassador at Washington.

£       £       £

**Economic Review** by the National Institute of Economic and Social Research, 2 Dean Trench St., Smith Square, London S.W.1. (Number 1, Jan. 1959, 54 pages, \$1.19. Annual subscription for six issues, \$6.)

Competent studies of economic "trends"—long familiar in the U.S.—have been a rarity in Britain. There has been no shortage of statistics, but that is not the same thing. The lack was of interpretive analysis from a non-governmental source of current business trends of a sort that would be of immediate value to those charged with business decisions and indeed to Government officials whose concern is the direction of the economy as a whole.

To meet this need the National Institute has begun the issue of a series of two-monthly reviews. The first Review (January 1959) includes a summary of the present outlook and aspects; a detailed study of internal trends and also of international trends. The whole is well supported with charts, tables and a statistical appendix. The prospect is at root a cheerful one: private investment lags, but this follows several years of remarkable expansion. In the immediate future spending by public bodies is looked to as the main stimulus in this sector. Consumption which has lagged, should pick up in the coming months, but is not expected to be excessive. Inventories continue to be run down, a depressive

factor and a main reason for not expecting a rapid rise in production in the immediate future. On the other hand, the investment of the past few years has given Britain for the first time since the war, capacity to meet new demands without at once running into "excess demand" problems. Externally, a strong position is expected for the coming year, if not so favorable as last year.

Conclusions of this sort are not new: perhaps it was inevitable in this first essay that it would confirm a picture already fairly well established; but the detailed supporting work permits a reasoned and not merely an impressionistic picture and the value of a regular and frequent assessment of the economy on the lines of this first survey is unquestioned.

The survey has been made possible by grants from British business and industrial firms and from the Ford Foundation. The Institute is a non-profit concern which has a reputation for the highest academic and statistical standards.

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**The Herring and Its Fishery** by W. C. Hodgson (Routledge and Kegan Paul, London, 1957, 197 pages, 25s.)

The herring is a mysterious fish, coming and going in a manner not properly understood even now. Sometimes there are millions of them, sometimes only a few. For those who care to examine this fish business, here is the book. How are herrings caught? What is their food value? How far does science aid in catching them? What influence does the moon have on herrings? These and many other questions are answered fully in this book which is illustrated with numerous pictures, charts, and tables.

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**Nationalisation in Britain** by R. Kelf-Cohen (Macmillan, London, 1958, 310 pages, 25s.)

Nationalization of industry was adopted by the Labour Party of Britain as a means, or rather one of many means, of bringing into being the concepts of social organization for which the party stood. Over a decade has now elapsed since the first post-war Labour Government implemented its ambitious program. Now, at a time when the nationalized industries have for the most part been accepted as part of Britain's economic structure, there comes this examination of their construction and growth—an account which is subtitled, "The End of a Dogma." It is critical, but informative too.

Mr. Kelf-Cohen's interest in nationalization is almost half a century old. In September 1911 he moved a motion in the Debating Society of the Manchester Grammar School that, "This House approves the Nationalization of the Railways." Mr. Kelf-Cohen's case failed. Looking back now on this and other attempts, the author is astonished at their slight intellectual efforts. "We were content to prove that everything was wrong with the existing set-up. Faults were many and easy to find. But when we turned to alternatives, we talked airily of compensating existing shareholders and setting up a Public Board to run the industry. That was about the sum total of our constructive thinking."



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